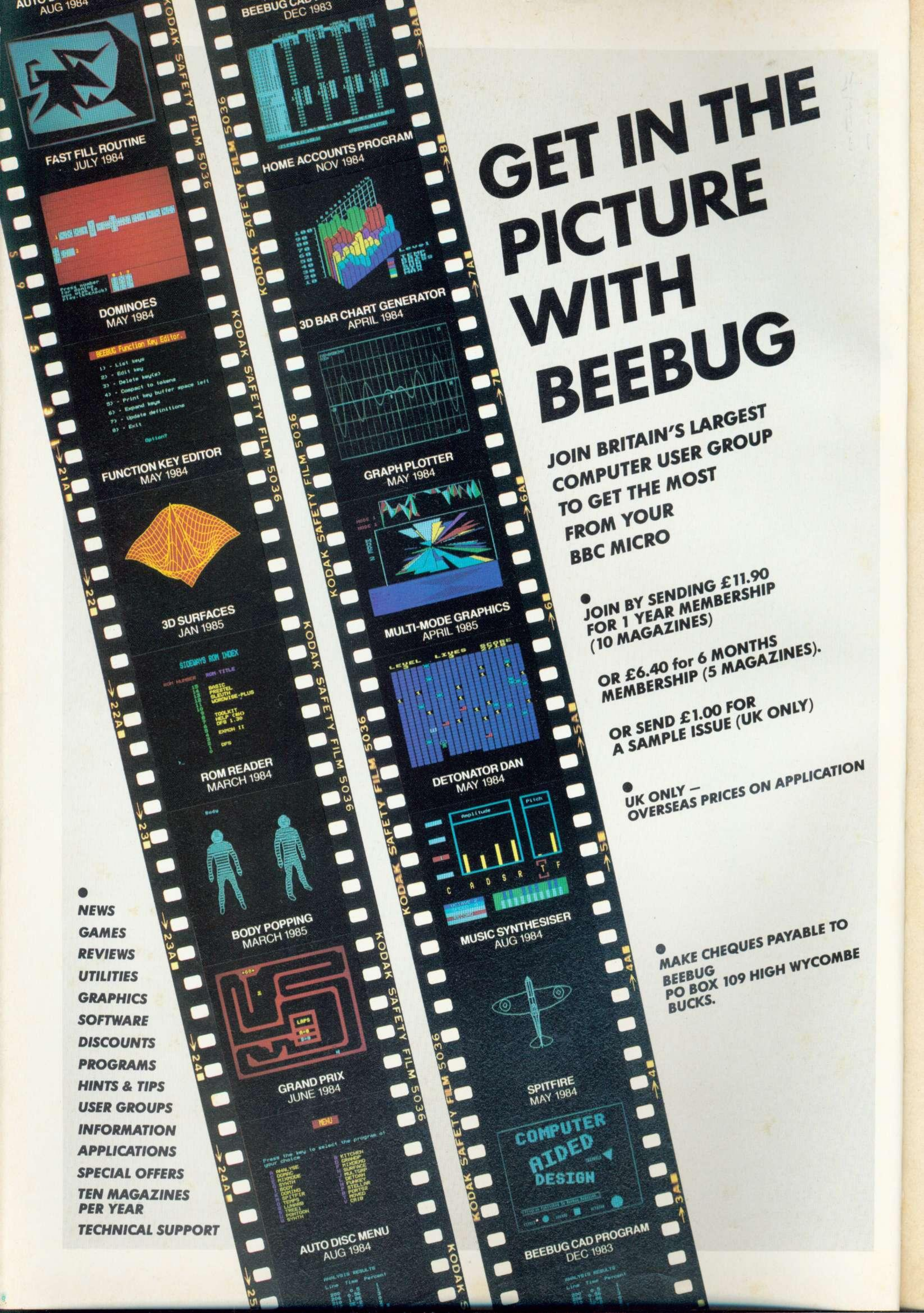

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JULY 1985
BBC B+:
What you get for the extra cash
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Joe Telford gives his blueprint
LANGUAGES:
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Menu program
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Is Disc Doctor still tops?


AUTO DISC MENU
AUG 1984
FAST FILL ROUTINE
JULY 1984
DOMINOES
MAY 1984
BEEBUG Function Key Editor.
FUNCTION KEY EDITOR
MAY 1984
3D SURFACES
JAN 1985
SIDEWAYS ROM INDEX
ROM READER
MARCH 1984
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NEW USERS

ATOM

YELLOW PAGES

The major listings for this issue are printed in the yellow section starting on page 97. These are also available on cassette (which includes a tape-to-disc transfer routine and index program) and in bar code format to save you typing them in. Details of how to order these on pages 96 and 103



Micronet members look out for free *Acorn User* programs.

REVIEWS

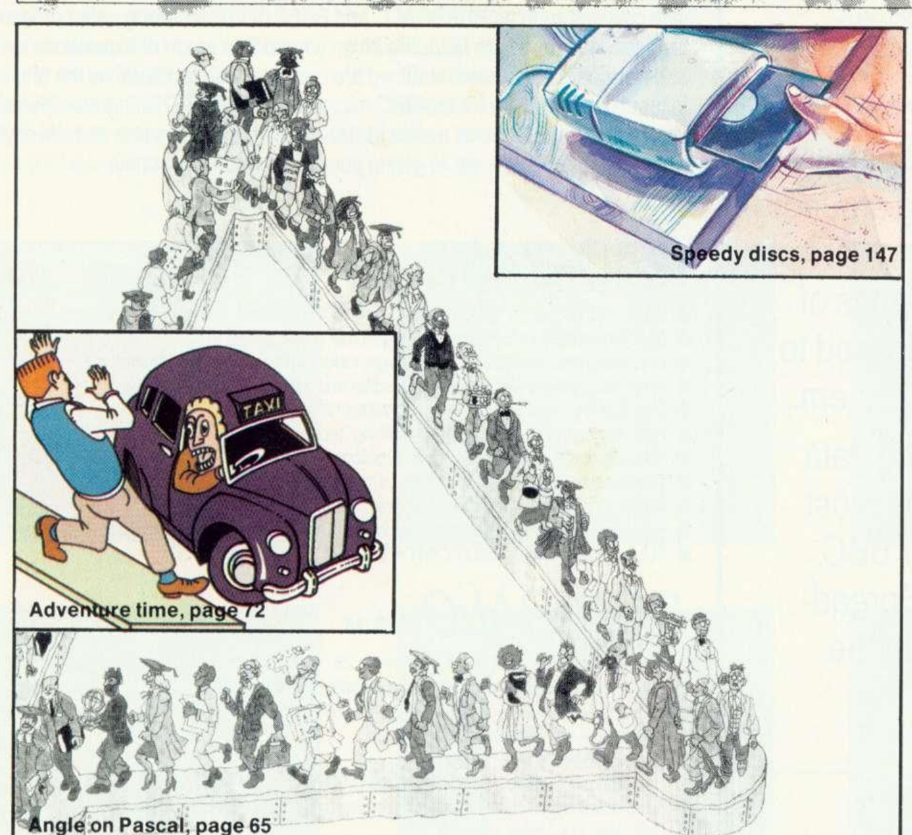
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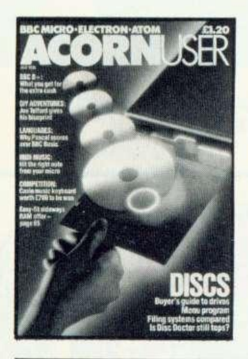
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DISCS

BUSINESS



Acorn User
July 1985
Issue number 36

Cover photography
by Chris Ryan

NEXT MONTH

COMMUNICATIONS SPECIAL

Hardware and software
Jeff Ashurst tells you what's on offer

Guide to databases

DIY Bulletin Boards
We look at six systems that have recently been set up on Beebs

Communitel
Robin Mudge reports

Micronet
An inside view

Languages
The spotlight will be on Forth in our series

Painting box
The first of a three-part series on graphics, conducted by Martin Phillips

Notes for authors

Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text with diagrams and screen dumps on separate sheets, or on disc in *Wordwise* (saved as a *SPOOL file using option 8) or *View* format. Leave large margins to allow space for editing.
Please enclose all programs on disc or cassette, with listings if possible. Also follow the style used in presenting listings in the yellow pages section. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything, and keep a copy. Enclose a suitable stamped, addressed envelope if the submission is to be returned. Attach a short letter with the article giving its title with a daytime phone number if possible. Address your article to the Technical editor. Articles are acknowledged on receipt, but not submissions for the regular columns, letters pages and competitions. Please limit telephone enquiries to the Technical editor to Wednesday and Thursday afternoons.



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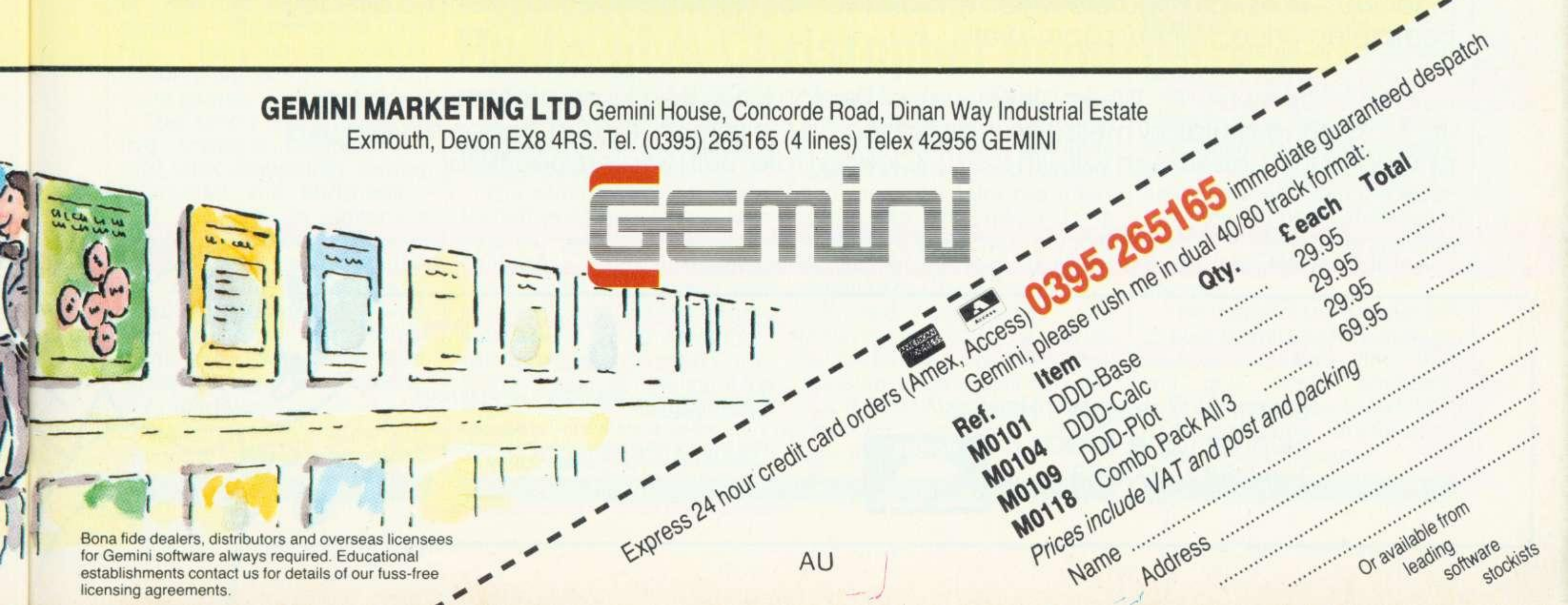
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THE MAP (SCREEN H)

SCREEN L

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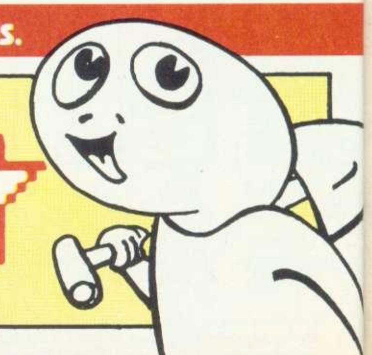
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School DOS rule could hurt Acorn

THE race is on for Acorn to develop a 16-bit micro for schools as the government decides on a new education software standard and other companies set out to break Acorn's domination of the education market.

ACT, RML and Apple are all out to soak up the lucrative upgrade market to 16-bit micros in schools. ACT has slashed the price of its F1E (see below), RML has the IBM-compatible Nimbus, and Apple is offering half-price Apple IIs and a third off the Macintosh.

Acorn's 32016 add-on has yet to be released, and the other ABC micros have been scrapped or will be built only to order. The B+ looks overpriced and badly equipped against the new competition.

But the latest threat to Acorn comes direct from the government, which is preparing a new policy for classroom computers. There's a prospect that Whitehall will opt for MS-DOS as the standard operating system for school micros – for which there's no Acorn machine at present.

The decision is expected to be made by the Department of Trade and Industry, which ran the 'Micros in Schools' scheme.

The department's junior information technology minister, John Butcher, has made no secret of the fact that he sees MS-DOS as the best way of opening up world markets in educational software to British software houses.

He told *Acorn User*: 'While noting the current popularity of MS-DOS for business systems, the government has not decided on a preferred operating system for educational microcomputers.

'However, I am anxious that we should give some thought to the advantage of developing guidance before the newer generation of 16 and 32-bit micros is widely installed.

'The Department of Trade and Industry is therefore consulting suppliers of hardware and software as well as users about whether to recommend a particular operating system, programming languages and other features. In principle, there should be advantages both to users and suppliers of hardware and software in some measure of standardisation.'

Mr Butcher added: 'We want users to have the widest possible choice of good software and British suppliers to be able to benefit from the existing and future educational market in the UK in tackling wider markets at home and abroad.'

The department is expected to take a while before making its announcement, time that will give Acorn breathing space to introduce its own MS-DOS-compatible machine – possibly later this year.

Telecom takes up game of MUD

MUD – the dial-in adventure game – has been adopted by British Telecom and will be running by the autumn. BBC users with a 300/300 or 1200/75 modem will be able to play the game with up to 100 other adventurers at the same time.

As with most adventures, the player has to travel through rooms fighting off villains and growing in power. The difference is that Mud has a thousand rooms and player participation is interactive – what one player does affects the others. All this takes up about 5Mb on a Vax minicomputer.

The aim of the game is to become a wizard. Once you reach this stage you can't be killed, and as Simon Dally who is marketing the game explained: 'You get new commands and have fun from creating fun for others by changing the game.'

Mud was originally written by Richard Bartle and Roy Trubshaw at the University of Essex, where it has notched up 40,000 player-hours. They have doubled its size for the BT version.

Subscribers to the game will be charged £20 for a starter pack, which includes some free playing time. After that it will cost £2 per hour, plus the price of the phone call.

Details from Muse Ltd, 6 Albemarle Way, London EC1Z V4JB.

Teenage pirates caught redhanded

FOUR software pirates have been taken to court but the outcome is unlikely to please the software industry. For instead of receiving hefty fines the pirates – all teenagers from Hull – have got off with an undertaking not to copy any more games.

The action was brought by five software companies – A&F, Artic Computing, Anirog, Thorn-EMI and Mirrorsoft – and followed an advertisement in a Hull newspaper offering cheap copies of leading computer games. Artic hired a private detective, who went round to the address given and saw the four teenagers making copies of some of Artic's titles.

A court order enabled the counterfeit copies to be seized.

Apricot slice poses threat

by Geoff Nairn

ACT, the leading UK business micro manufacturer, is looking to steal some of Acorn's market with its Apricot F1E machine. The Apricot F1E is more expensive, but it's also more sophisticated than the BBC micro – and now it can run the BBC Basic language.

The price of the Apricot F1E has been slashed to £595, for which you get a 16-bit machine with built-in 3.5in disc drive, networking and 256k of RAM – four times the BBC B+ at £499. For an extra £30, the B-Tran software allows programs written in BBC Basic to run on the Apricot, although machine code programs or any which rely on the Beeb's hardware will not work.



The pricing strategy reflects an attempt to capture the remaining UK education market. ACT's marketing manager James Blackledge said: 'There's a gap between the home and business machines which we're looking to fill with the Apricot. Schools are looking for something more sophisticated than the B+.'

ACT sees the machine being used for teaching Basic programming alongside BBC micros.

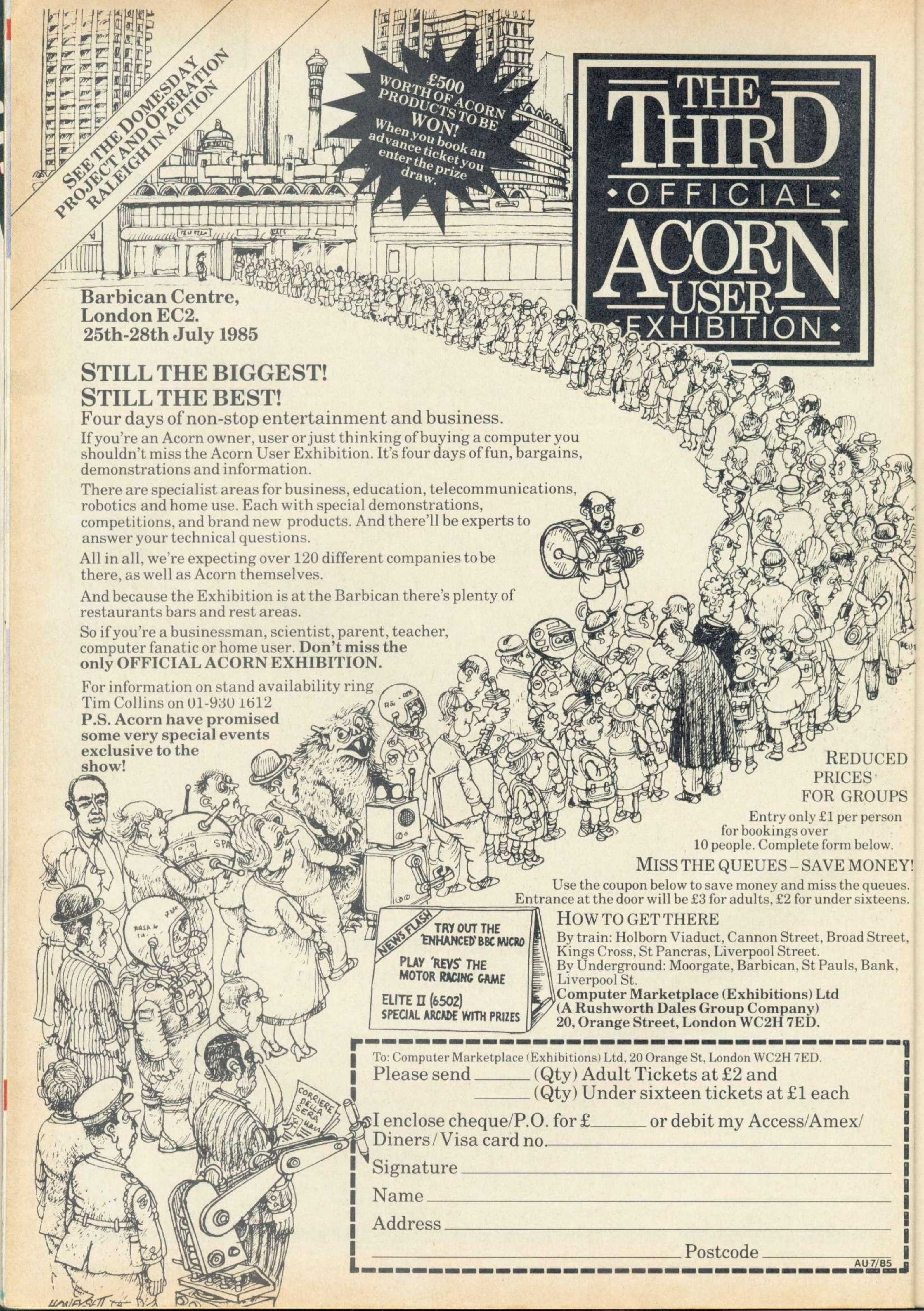
Beebs give Christopher hope

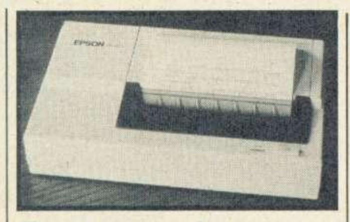
TWO BBC micros are at the heart of an experimental project that could bring benefits to handicapped children.

The scheme, Project Christopher, is named after a four-year-old patient at the Great Ormond Street Hospital, London who is paralysed from the neck down. Hardware and software is being developed with DTI funding to meet Christopher's special needs but the results will be of significance to many.

One of the Beebs is aboard Christopher's battery-operated wheelchair, controlling its movements and operating speech synthesis and recognition units. An infra-red interface links this micro to a stationary Beeb with monitor through a keyboard emulator supplied by Clwyd Technic.

Project Christopher will feature in a BBC TV series called *With a Little Help from the Chip*, to be broadcast later this month. Also, watch *Acorn User* for 'Trailblazer' coverage of the project.


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Battery printer

EPSON's latest offering is the P40, a portable printer which runs on rechargeable batteries. It has a claimed speed of 45 characters per second and costs £99.95. Paper comes on a roll 5in wide.

Tesco complains

TESCO, the supermarket chain, has taken exception to Epson using its name in advertisements. A complaint from the store to the Advertising Standards Authority has resulted in Epson agreeing to stop using the name.

Another company in lumber with the ASA is Database Publications, which was chastised for not being able to supply a 'body building pack' advertised in *Micro User*.

Acornsoft and Sinclair also fell foul of ASA in pushing their wares in February – *Viewsheet* and the QL.

College net

WINNET is the latest BBC network system, designed at Winchester College. To connect eight Beebs would cost £450 plus VAT. Winnet can support up to 16 micros sharing discs and up to four printers. Details from Dr J Havil, Winchester College, Winchester, Hants.

Bear update

BEAR Hardware, which specialises in Atom items, has released a catalogue of new releases including a screen-drawing package, Logo turtle graphics and software by Program Power. Contact 68 Harmondsworth Lane, Harmondsworth, Middx UB7 0AA.

Robot gathering

JULY 2-4 are the dates for the Personal Robotics Congress at the London West Hotel. The conference and exhibition are being organised by Oyez, tel: 01-236 4080.

Torch and Logica

TORCH and Logica have got together to enable software using the Unix operating system to be transferred across British Telecom's X25 network.

Acornsoft db in ROM

VIEWSTORE and *View* 3.0 are two of several new releases of ROM-based software for the Beeb.

Viewstore is a free-format database capable of handling as many records as you want. The only limit on record size is the memory capacity of your micro, up to 5k on a BBC and up to 30k on a 6502 second processor and B+. There may be a variable number of characters within a field and a variable number of fields within a record. Fields may be up to 239 characters in length with a title of 254 fields per record.

Two types of display are possible – either spreadsheet or card index type. Indexes allow the user to search rapidly through a record of any length. Data input validation is possible and higher and lower limits may also be set. Three data types include text, numeric and date (English or American).

Viewstore is fully compatible with *View* and records may be read into text files.

The package comes complete with user guide and utilities disc and will be available by mid-June at a cost of £59.80, including VAT.

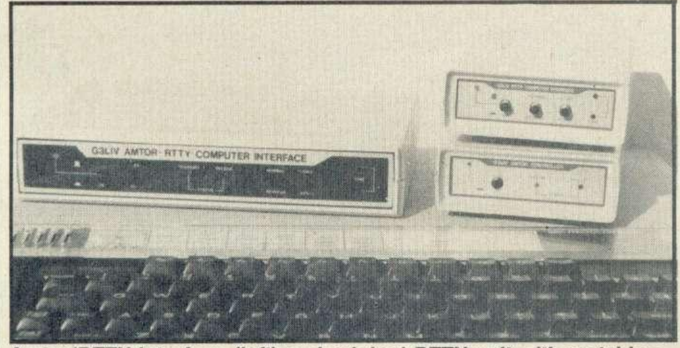
View 3.0 is an enhanced version of *View* 2.1 with 'all known bugs' killed. Several additions include two new commands. SETUP allows the user to predefine modes of operation, such as Justify and Format, before entering *View*, perhaps as part of a !BOOT file; and a working text file name may be defined using the NAME command. All commands may now be fully abbreviated.

The system also contains an automatic relocator for the second processor, re-initialising itself as *Hi-View* when the 6502 is switched on. OLD is now automatically performed when Break is pressed, and NEW is executed on power-up.

View 3.0 costs £89.70, the price including a printer driver generator on disc and cassette.

Viewspell is a full spelling checker for use with *View* containing more than 70,000 words based on the Longman's English Dictionary.

Viewspell will be available in the autumn.



Amtor/RTTY interface (left) and original RTTY unit with matching extender box – all from Johnny Melvin, callsign G3LIV

Databank for disabled

A NATIONAL database of information on software for the handicapped has been set up.

Known as Bardsoft, the database is the largest of its kind in Europe and contains information on a wide range of software for 'special needs', categorised by 40 makes of micro, including BBC models A and B and the Electron.

Bardsoft is an extension of the British Database of Research into Aids for the Disabled (BARD), an information-gathering project run by the Handicapped Persons Research Unit (HPRU) at Newcastle upon Tyne Polytechnic.

Information is organised under 10 main 'descriptors': perceptual/motor, cognition, numeracy, communication, training/therapy, assessment, teaching, employment, recreation and general. Charges for a printout vary according to number of records involved, so that at present a complete printout for the BBC B costs about £44 while one for the Electron costs £4.60.

Printouts of a specific search cost 10p per record (minimum £1).

Contact the HPRU on (0632) 326002, ext 4211.

● Nordis Software markets programs suitable for teaching the handicapped at special schools. Available on six discs or cassettes for the BBC micro, the packages cover 'Pre-reading' (matching and sequencing programs plus four games), 'Number' (two sets) and 'Time' (three sets) and cost £15 per set.

Further information on (0604) 34833, ext 5525.

RTTY upgrade for Beeb hams

JOHNNY MELVIN of Newcastle has been marketing a Beeb-dedicated RTTY unit for transmitting and receiving radio teletype signals for two years. Now he has boxed the unit to include an error-checking system known as Amtor – Amateur Microprocessor Telex Over Radio.

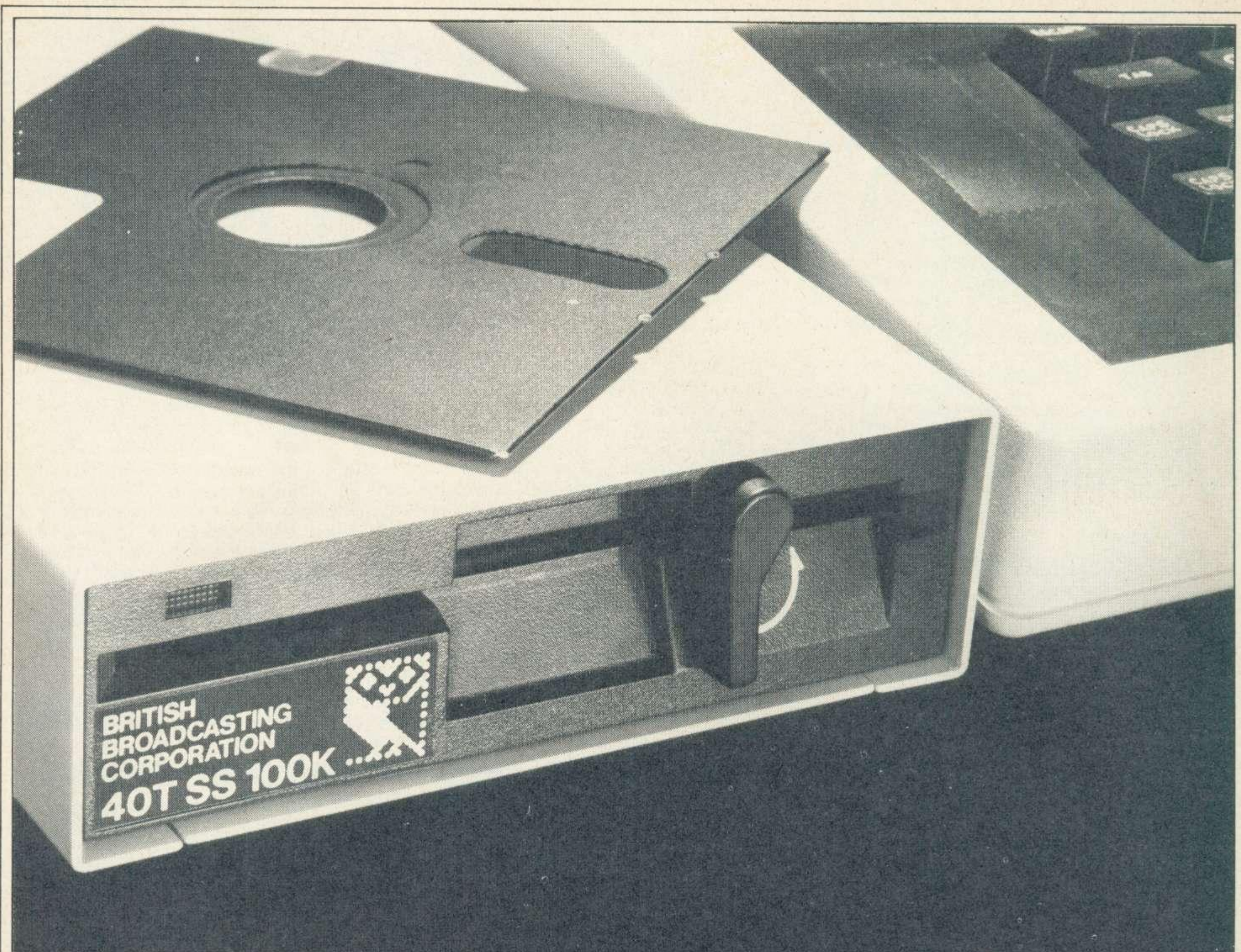
The Amtor/RTTY terminal adds Amtor control circuitry to the original interface, including solid state PTT switching, Xtal-controlled 1KHz tone, mono delay circuit and status indicators. While the stations are in contact the two micros have control of the link and both transceivers are kept in sync.

The software is available in ROM and the interface connects to the Beeb's user port, with power and terminal/computer links through a 20-way ribbon.

Existing customers can upgrade their original RTTY terminal to Amtor mode with an extender unit in matching box that clips onto the cable.

The Amtor/RTTY terminal costs £112.50 (ROM £27); the RTTY interface is £77 (ROM £20); and the Amtor add-on £43. The 20-way cable costs £10. RTTY and SSTV PCBs are also available.

Contact Johnny Melvin on 091-284 3028 – callsign G3LIV.



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Micro training for food selling

SUPERTRAIN is a BBC micro simulation game for budding supermarket managers. It costs £25 on tape and was written at UMIST in Manchester with the help of a large food retailer.

Up to five stores compete for the week's trade and players have to make decisions on prices, stock levels and marketing policy. The Beeb then produces operating results.

Also available is Wholetrain covering wholesaling. Details from Dr J Freeman, Management Sciences, UMIST, PO Box 88, Manchester M60 1QD.

Denser ROM

VINE Micros has released a double-density version of its tape to disc transfer ROM. The new type 1770 will suit Opus 3.45 and Solidisk DDFS (working in single density). It can only be used to transfer programs for personal use, and costs £18.

RAMs down

FOR Beeb owners of a practical bent, Aries Computers has reduced the price of 8k RAM chips. The 6264 chip costs £10 plus VAT and can be used to provide 8 or 16k of sideways RAM in commercial sideways ROM boards.

An application note is available from Aries. Details on (0223) 862614.



Maltese treat: graphic winner from an island in the sun

Malta's Beeb outpost

SUMMARISING the Mediterranean charms of its creator's homeland, this program by Mario Camilleri won a graphics competition staged by Malbeeb, the BBC Micro Users' Club of Malta.

This enterprising outpost of Beeb exploiters, which now boasts a membership of nearly 150, put on a one-day exhibition this spring to demonstrate the versatility of its own activities – and of the micro itself.

The show – the first of its kind on the island – proved to be a bustling success, attracting 800 visitors.

On display were 16 Beebs, each station equipped to demonstrate a different aspect of the hobby. Peripherals in action included a 6502 second processor, Acorn and Torch Z80s, a Grafpad, light-pen, tracer, turtle and the AMX Mouse, making its Maltese debut (no falcons, though). Stands included a BBC connected to a radio transmitter, demonstrations of wordprocessing using both *View* and *Wordwise*, an introduction to CAD and a taste of computer music, generated under the TMS package.

For more information about Malbeeb write to club president Ray Zammit at 20 Oleander Avenue, Santa Lucia, Malta.

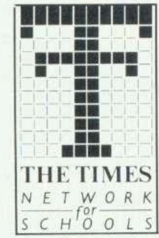
Prince moves with the Times

by Geoff Nairn

PRINCE PHILIP is the latest subscriber to the Times Network for Schools and, in the process, a BBC micro owner. He created an electronic message on his Beeb which was then transmitted to a Berkshire primary school using the network.

The occasion was the opening of Berkshire's new schools computer centre, described as an 'important milestone' by the Prince. Unfortunately, subscribers to the Times Network will not be able to send messages to Prince Philip, for his mailbox number is a closely-guarded secret – hopefully more so than his Prestel mailbox!

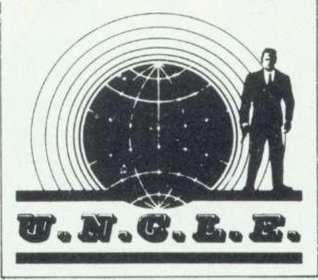
The Times Network is an electronic information service which combines a database of educational information with electronic mail. Over a thousand secondary schools have signed up so far and in the autumn the service will be extended to primary schools.



By 1986 polytechnics should also be on-line and school leavers will be able to look up course vacancies using the network. An application form for the chosen course can then be 'filled in' electronically and transmitted to the polytechnic in a matter of seconds.

The Network is also negotiating with UCCA, the clearing house for university applications.

Meanwhile, the Stock Exchange, a major sponsor of the network, is offering schoolchildren the chance to dabble on the stock market. The 100-Share Index service draws on the Stock Exchange's Topic dedicated viewdata system and will shortly appear on the network. A competition based on the index is planned.



Our regular columnist finds things are hotting up

WELL, the B+ is here. I haven't seen one yet, but by all accounts it's as expected. Standard machine plus paged screen RAM (shadow is the trend word), disc interface and a few additional geegaws. For retailers, the major disappointment is that it looks exactly the same as the B – no go-faster stripes or anything. For £100 or £150 more than the B, you think they could at least have added fog lamps or central locking.

It's curious Acorn's chosen this route for development, after all the initial razzamatazz about second processors. OK, the 65C02 and Z80 eventually appeared, but where's the much-vaunted 16032 (or 32016, depending on which press release you read)? Eight bit machines are pretty old hat by now, whether they have 32 or 64k RAM. If, in addition, the manufacturer of such a machine has the brass neck to increase the price while all around are lowering theirs, trouble cannot be too far away.

Limbering up on the touchline is 'Barmy Jack' Tramiel of Atari, with the firm promise of cheap 16-bit micros running Gem, which will bring Apple Macintosh-type screens, in glorious living colour, to the unwashed masses.

Dark rumours of a 'new' new Acorn machine abound. Even darker ones suggest this will still be based on the old eight-bit technology. Madness. Acorn have an ideal opportunity to get into 16-bit the painless way. They dominate in the education market. The B was designed for expansion – so expand it before it's too old. Bring out a 16-bit second processor running a decent operating system, and flog it to the secondary schools, polys and universities who are already committed to the BBC.

Software compatibility, that old excuse for doing nothing, is partially maintained while an opportunity is provided to develop new software and hardware. It's called market development.





So now you have got your home computer, you're ready to talk to Cumana – the best name in memory. Already a market leader throughout Europe for their range of disk drives, Cumana now have other products on offer, all to the same exacting standards that have made their disk drives the number one choice in the home and in education.

The Touch Pad

The Touch Pad is a low-cost graphic plotting aid for the BBC micro. This compact display cursor moving device simplifies programming with the touch of the stylus.

The product comes complete with an instruction booklet, basic software, stylus and connecting cable. Its uses are in graphics, computer aided design, education and games.

TOUCHPAD LOWER PRICE

£54.95

including VAT.

BE SAFE NOT SORRY

Cumana's CS range of disk drives have been subjected to the strict safety demands of the BEAB.
They have now been awarded BS415 approval, so if you value safety do not trust it to anything less than Cumana.
Cumana's dual range of disk drives have also been submitted for approval.







Disk Drives

Cumana have spent years on research, development and marketing a range of drives second to none. Their drives are compatible with BBC, Spectrum, Dragon, Oric, Tandy Models III and 4 and Video Genie. They are fully guaranteed for 12 months and approved for electrical safety by the D.M.E.E. and are extensively used in GLC and ILEA establishments. Cumana were the first independent disk drive supplier and are now Europe's market leader. Their products have been proven in the schools, universities and homes throughout Europe. Let us drive you in the right direction, send now for further details of the Cumana range, or see them at our distributors and at selected branches of W.H. Smith, Lasky's, Greens, Currys, and Spectrum UK.

DRIVE CUMANA

The Acorn Electron Computer
A microcomputer with a proven track record. Using BBC Basic, the Electron was developed out of the Micro that has been chosen for over 80% of schools participating in the Government's current Micros In Schools project. It connects into almost any TV set and cassette player and is supplied with a comprehensive User Guide which runs through, in a simple to follow manner, the basic principles of programming. A wide range of software is available, including games, educational packages and home accounts.

Disk interface now available for the Acorn Electron
£114.95 including VAT.

Diskettes
Only when Cumana found a double density diskette up to their stringent quality control requirements, and at a price that made sense to the end user, were Cumana ready to put their name to it.

The result was a top quality diskette, complete with a plastic protective case for the ten-pack (they are also sold in two-packs!) together with index stickers.

Cumana diskettes are available now in both 5¼ inch and 3½ inch as single or double-sided, 40 or 80 track, from your local computer dealer. Don't trust it to chance, go for the best name on record.

Cumana BBC Microcomputer compatible disk drives: retail price list.

Cumana disk drives supplied with formatting diskette, drive connecting cable and comprehensive user manual. Independent power supply, mains lead and moulded plug included.

5½ INCH DRIVES

100 40 Track single sided (100K)	**£119.95**
100 40 Track single sided (100K)	**£129.95**
200D 40 Track double sided (200K)	**£159.95**
400 80 Track double sided (400K)	**£179.95**
200 2 x 40 Track single sided (200K)	**£219.95**
200 2 x 40 Track single sided (200K)	**£249.95**
400D 2 x 80 Track double sided (400K)	**£299.95**
800/S 2 x 80 Track double sided switchable (800K)	**£329.95**

3½ INCH DRIVES

CS351 40 Track single sided (100K)	**£147.78**
CS354 80 Track double sided (400K)	**£199.96**
CD352 2 x 40 Track single sided (200K)	**£260.83**
CD358 2 x 80 Double sided (800K)	**£373.87**

5¼ INCH DRIVES (less power supply)

CSXL100 40 Track single sided (100K)	**£99.95**
CSX100 40 Track single sided (100K)	**£109.95**
CSX200D 40 Track double sided (200K)	**£129.95**
CSX400 80 Track single sided (400K)	**£149.95**
CDXL200 2 x 40 Track single sided (200K)	**£189.95**
CDX400D 2 x 80 Track double sided (400K)	**£249.95**
CDX800/S 2 x 80 Track double sided switchable (800K)	**£289.95**
Q.F.S. Double density disk filing system	**£79.95**
Now available disk interface for the Electron	**£114.95**

3½ INCH DRIVES (less power supply)

CSX351 40 Track single sided (100K)	**£139.95**
CSX354 80 Track double sided (400K)	**£199.95**
CDX352 2 x 40 Track single sided (200K)	**£256.95**
CDX358 2 x 80 Double sided (800K)	**£383.95**

A selection of peripheral covers, diskettes and data cassettes are also available. For details contact Cumana.

ALL PRICES INCLUSIVE OF VAT (DELIVERY CHARGES EXTRA)
ALL 80 TRACK 5¼ DRIVES ARE SWITCHABLE TO 40 TRACK MODE
ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

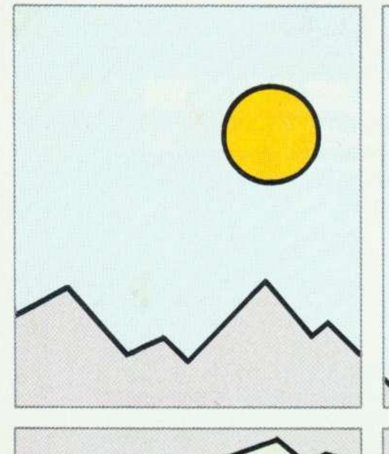
DISTRIBUTORS/RETAIL

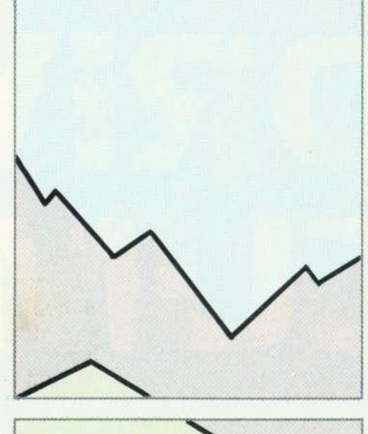
Available from the following retail outlets: W. H. Smith, John Lewis Partnership, Greens Leisure, Laskys, Spectrum UK.

Area distributors:
Addons Ltd (Southampton) 0703 34775/6. Audio & Computer Centre Ltd (Jersey) 0534 74000. Eltec Home & Business Computers (Bradford) 0274 722512. Fairhurst Instruments (Wilmslow) 0625 525694. HCCS Associates (Gateshead) 0632 821924. Hugh-Symons Distribution Services Ltd (Bournmouth) 0202 26535. Kingdom Design (Belfast) 0232 643720. Lightning (Harrow) 01 969 5255. Microage Distribution Ltd (North London) 01 205 7688. Microworld (Edinburgh) 031 228 1111. National Micro Centre (Stockport) 061 429 8080. Northamber PLC (Chessington). Silicon Express (Leicester) 0533 374917. Thompson Cook Distribution Ltd (Birmingham) 021 328 3895. J. S. Simnett Computers (Kingston-upon-Thames) 01 541 1495.
+ National Dealer Network

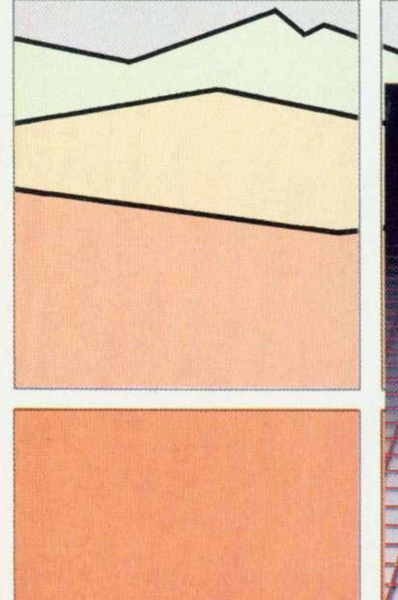
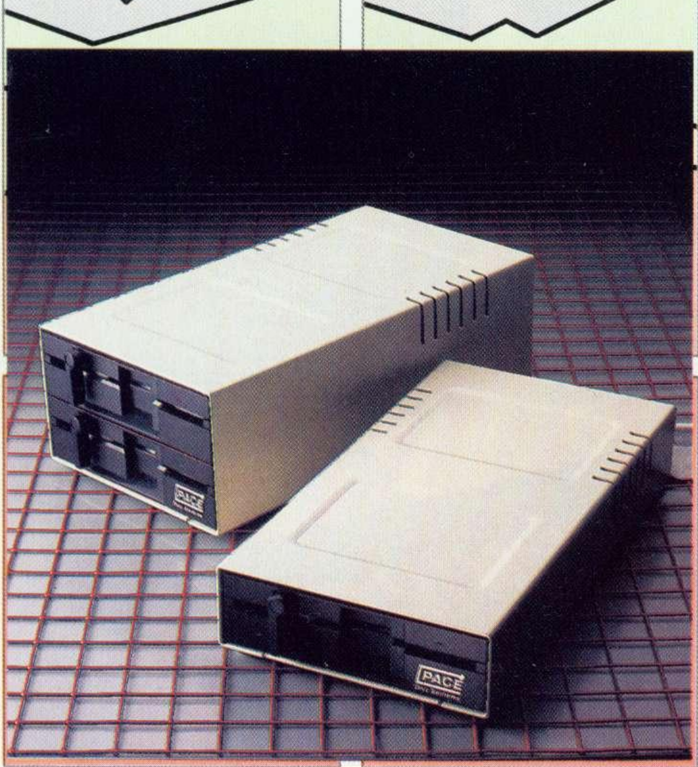
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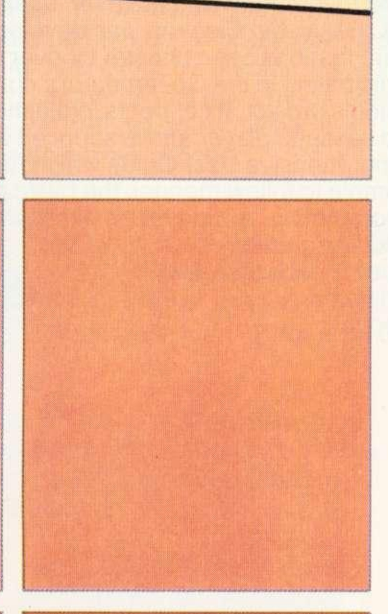
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But the quality doesn't stop with the mechanism. The cases are functional yet attractive enamelled aluminium. Only the highest quality data cables are used and each drive is individually tested before and after building. Our after-sales service is second-to-none.

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Telephone 0274 729306
Telex 51564

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Spritely Logo

LOGOTRON is releasing its new Spriteboard at the show to coincide with a special *Acorn User* offer, details of which will appear next month.

The Spriteboard plugs into the 1MHz bus and uses Logotron's own version of Logo. It supplies an extra 20k of RAM, thus freeing the normal memory used by the Beeb for its screen to store user programs.

Thirty-two sprites may be defined at a time and the board allows even the novice Logo programmer to put together true animation sequences.

A utilities disc brings further enhancements to Logo and includes Control Logo, graphics utilities, toolkit-type utilities for screen dumps etc, and a debugging aid.

Inclusion of a USE command allows advanced programmers to write machine code primitives to enhance the system further.

The Spriteboard, including Logotron Logo, costs £239.95 including VAT and is available to educational establishments at a discounted price of £175 plus VAT.

Souped-up Elite

ELITE hustlers won't want to pass up the chance of playing *Elite II*, the souped-up version of Acornsoft's mega-hit, at the show.

Version II requires a 6502 second processor to be fitted and of course is much faster than the original version and is played in glorious colour!

Launch-pad for *Elite II* is Acorn's Games Corner, stand 153, on the upper level.

Motor-racing aces can step



up and try their skills at *REVS*, Acornsoft's new Formula 3 Silverstone Grand Prix simulation – reviewed on page 157 of this issue.

Pick up UserRAM

SHOW visitors can collect their *Acorn User* UserRAM easy-fit sideways RAM pack from our stand (No 45-45a), opposite the Acorn stand.

Turn to page 85 for full details.

Four days of fun and wizardry



THE Third Official Acorn User Exhibition will take place at the Barbican Exhibition Centre, London, on July 25-28 inclusive (Thursday to Sunday).

There will be more than 120 exhibitors, including of course *Acorn User* magazine and Acorn itself, occupying stands on the upper and lower floors of Hall A. The show will be divided into sections to cover home, business, education, telecomms and robotics.

Entry on the door is £3 for adults and £2 for under-16s and block bookings for 10 or more people cost £1 per person. You can save money by reserving tickets in advance: adults at £2 and children £1. Contact Computer Marketplace Exhibitions at 20 Orange Street, London WC2 or phone 01-930 1612.

Doors open each day at 10am, although admission is restricted to the trade during the first three hours of Thursday. Closing time is 6pm, except on Sunday, when the show finishes at 4pm.

Graphics ROM revealed

THE long-awaited Acornsoft graphics extension ROM will be on sale at the show.

The ROM is the official MOS extension and uses all except three of the previously reserved PLOT codes. The GCOL and VDU23 commands have also been extended to allow the programmer to take advantage of pattern effects.

The new PLOT codes provide the user with circle outlines and circle fills; ellipse outline and fills; drawing arcs, segments and sectors; rectangles and parallelograms. Also included is the ability to flood-fill any shape, and the triangle PLOT commands have been extended to take into account the new pattern fills.

Dotted lines may be drawn to a specified bit-pattern, thus allowing any combination of dots and dashes.

Sprites are catered for, and up to 255 may be defined at a time, providing there is enough memory free. No special commands are installed to move the sprites or test for sprite collision. A full sprite editor is included, however. The graphics extension ROM costs £29.95.

AUTHORS

	Thurs	Fri	Sat	Sun
Mike Barwise		am/pm	am/pm	
Ed Brown			am/pm	
Chris Drage			am/pm	am/pm
Nick Evans	/pm	/pm	/pm	am/pm
George Hill				
Martin Phillips	/pm			
Harry Sinclair			/pm	
Joe Telford	/pm	am/pm	am/pm	
Simon Williams	am/pm	am/pm		

STAFF

Kitty Milne, Bruce Smith and Tony Quinn will be around for most of the four days, magazine schedules permitting.

Popular authors on show

MANY of the regular *Acorn User* authors will be around at the Show for you to meet and talk to. Also, the staff of the magazine will be there, ready to receive your comments on their efforts!

Authors and staff will be able to give hints and tips on articles, software and any facet of using your Acorn computer. Mike Barwise, who edits the Atom Forum column, will be on hand to answer queries on Acorn's first home micro.

The chart above gives an idea of who will be at the show and when. See next month's issue for confirmation of the times. Back copies of *Acorn User* with monthly listing cassettes, our very own software range and binders will be on sale.

Domesday and Raleigh stars

SECTIONS of Acorn's stand will be set aside to keep show visitors posted on two major UK youth projects in which the Beeb is playing key roles.

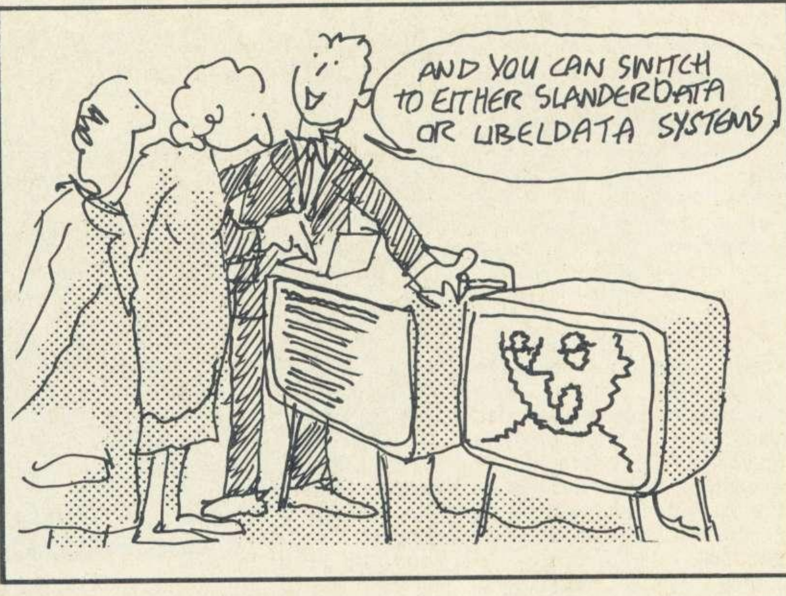
You can see how the micro is being used to log important scientific data being collected in exotic locations as part of the international *Operation Raleigh*.

And Acorn will be focusing on the Domesday project, in which schoolchildren throughout the UK are collecting information on their own locality for assembly into a huge national database on video disc.

WIN A B+!

Great competition to win a BBC B+ will be run by Acorn User at the Show. See next month's issue

Lessons for computers in legal history



LAWYERS and politicians are rapidly realising that the impending explosion in computer communications is about to throw up a host of unexpected legal quandaries . . . and the first have arrived.

by Bill Penfold

For once though, it is nothing to do with the rip-off world of software pirates and only in the most incidental way does it concern the code-cracking hackers.

The worry this time is whether 'publishing' laws devised to deal with cold print and instant broadcasting can always cope with computer links. The most obvious problem area is the boom in videotex and viewdata systems such as Prestel and the mushrooming bulletin boards.

It's a fair bet these offer new fields of delight and prosperity for the libel lawyers plus the prospect that the legislators will, before too long, have to start re-writing the statute books.

Splendid row

One puzzle which bears immediate investigation is – just what sort of medium is viewdata anyway? Is it broadcasting or publishing?

Acorn User readers may recall that last autumn this very issue was brought to the fore by a splendid row between British Telecom chairman Sir George Jefferson and Labour leader Neil Kinnock.

Labour launched its own closed user group (CUG) on Micronet but left some pages open to Prestel and Micronet users.

Sir George, worried that Prestel might be a 'broadcasting' organisation which had to maintain political balance, ordered the plugs to be pulled.

Eventually, the Home Office ruled that the government's 'intention' was that viewdata and cable text services should be regarded as publishing enterprises – just like newspapers and magazines.

That cleared up the Jefferson-v-Kinnock kerfuffle, but what is the strict legal position of viewdata when it comes to libel . . . or worse still, contempt of court?

After all, what may be an 'intention' may not actually be law.

It is something which both the information providers – who are regarded as the publishers – and their contributors, such as ordinary Micronetters, will have to take into account.

This became evident a month or so back when the interest of much of the computer world was aroused by a highly publicised court case. One editor – to save his blushes we won't name him, but regular Micronet users will know who we mean – appeared to come within a whisker of getting himself done for contempt of court.

What he discovered is what the greenest cub reporter is supposed to know – you don't comment on pending or current cases once charges have been laid.

By now my copy of L C J McNae's *Essential Law for Journalists* (price, 30 shillings) is well over 20 years old, but its chapter on contempt and privilege is probably as relevant to computer communications as it was in those forked-stick and quill days of the early 1960s.

Mr McNae points out that criminal contempt includes not just being insolent to the judge, or jurors eating in court, but also any publication offending the dignity of the court or tending to prejudice the course of justice in any pending trial or litigation.

Which is where we start coming to the tricky part, for the circumstances which the legal draftsmen had in mind did not include the idea of electronic journals.

As soon as charges are laid the case becomes *sub judice*. But it is possible to 'poison the stream of justice' even earlier by commenting on a case if there are grounds for believing a writ or an arrest is imminent.

In broadcasting the situation can be somewhat simpler. Say you have a recorded interview about a particular case, for instance, a witness to a High Street shooting, which goes out on the hourly news broadcasts from 7am.

At lunchtime it is announced someone is 'helping police with their enquiries' and it is fairly clear charges were about to be made. The prudent news editor stops broadcasting the eye-witness account and it is unlikely there is any contempt.

But what about printed publications? An evening newspaper with the same eyewitness account would have to make sure later editions did not carry the details, and even though earlier editions might still be available in news-agents, there should not be any real problems.

However, what about weekly publications? Imagine a magazine specialising in financial matters appears on the bookshelves on a Monday alleging it has uncovered a major fraud and, risking the threat of being sued for defamation, names the men it claims are behind the crime.

The magazine remains on sale all over the country throughout the week but by Wednesday the Fraud Squad has arrested a pair of City slickers. What then? Lawyers may disagree, but the experience of most journalists is that the magazine would probably be alright. It was published before the arrests and charges.

But where do videotex systems fit in? Say that same City story was put out by an information provider (IP) on the Monday afternoon, and at the time was perfectly OK. Then at 7pm on Wednesday arrests and charges were made which made the case *sub judice*.

However, the story remained available throughout the evening and night – when most Micronetters key-in – and was not taken off until the following morning when the IP staff arrived at their office. Was that story being constantly broadcast, or was it simply published on the Monday, like the magazine story? Frankly, no-one seems too sure. A tour of the Home Office, the Attorney General's office, Prestel and even the Registrar for Data Protection, was unable to elicit any firm guidance.

Prestel points out that it is part of every IP's contract to ensure nothing they put on screen is in breach of the law and it's the information providers who are responsible for anything that could cause a legal offence.

At the moment the problem can probably be regarded as merely a 'legal nicety', but as videotex and bulletin boards become ever more popular it is a legal uncertainty which threatens one day to turn into a nasty headache.

On show

□June 20–22, Micro Fair, Edge Hill College of Higher Education, Ormskirk, Lancs. Featuring an 'egg mover' competition where school teams use a robot to pick an egg from an egg-cup, without breaking it.

□July 2–4, European Personal Robot Congress, West Centre Hotel, London. Three-day event comprising a conference on personal robots, specialist workshops and an exhibition. £1.50 entrance for the exhibition (conference fee £250!). Further details on 01-236 4080.

□July 12–13, Manchester Schools' Computer Exhibition, Manchester Teachers' Centre, 137 Barlow Moor Road, West Didsbury, Manchester M20 8TD. Open to anyone interested in computers and the school curriculum. Contact 061-434 3421.

□July 25–28, Acorn User Show, Barbican, London. Yours truly putting all the rest of the shows to shame. Tickets £3 or £2 for under 16s. Enquiries on 01-930 1612.

□July 25–27, Networks 85, Wembley Conference Centre, London. Business exhibition devoted to computer and telecommunications networking. Enquiries on 01-868 4466.

□July 29–31, MUSE Summer Course, Jesse Boot Conference Centre, Nottingham University. Talks, conferences and an exhibition covering all aspects of computers in education. Price is £57.50 for the three days and further details are available on (0482) 20268.

□November 25–28, Gulf Computer Exhibition, Dubai International Trade Centre. Advance notice to *AU* readers in the Gulf about this business computer show.

To contact

□Acorn (0223) 245200

□Acorn's very own bulletin board service is Prestel-compatible (1200/75) and runs on (0223) 243642

□ BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system)

□BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send self-addressed envelope.

□Bulletin Boards:
CABB 01-631 3076
CBBS London 01-399 2136
Distel 01-679 1888
Forum 80 Hull (0482) 859169
Forum 80 London 01-399 2136
HAM-NET (0482) 497150
Liverpool Mailbox 051-428 8924
Mailbox80 (0384) 635336
Technomatic 01-452 1500
TBBS London 01-348 9400
TBBS Nottingham (0602) 289783
TBBS Southampton (0703) 437200

□MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne, NE7 7XA. Hardware and software support for schools. Please send SAE.

□MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Please send SAE.

□MUSE (Micro Users in Schools and Education), Freepost, Bromsgrove, Worcs B62 7BR. User group for teachers and parents. Please send SAE.

□National Extension College, 18 Brooklands Avenue, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send SAE.

□Software Limited configure CP/M programs for the BBC micro. Write to No 2 Alice Owen Technology Centre, 251 Goswell Road, London EC1N 7JQ. Tel: 01-833 1173.

For help

□To contact *Acorn User* authors, write c/o the editorial address given on page 2 of this issue.

□Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus SAE. These consist of three programs, including a screen dump, and three pages of notes on using these printers.

□Monitor choice: Photocopies of the review of four monitors, plus a set of nine test programs from the June 1984 issue cost 72p (inc post).

□Bulletin boards: Information on 26 free-access boards was given in the October 1984 issue. Send 54p for photocopy (see page 93).

□For *Acorn User* cassettes, discs, back issues and binders contact PHS Mailings on (02937) 72208 (see page 96).

On television

□*Database*, ITV, Thursdays starting 20 June, times vary with ITV region but is in the 10.30pm slot on Thames. For the fourth series of this popular show the Visicode telesoftware – the pulsating dot you see in the bottom of the screen – has been improved and can now transmit 1k of code per minute. Promised for the first programme: the winners of the British Microcomputing Awards, a Visicode-based competition, a feature on cellular radio and a report from the US on what must be the ultimate in dial-up databases – the Electronic Church.

□*With a Little Help from the Chip*, BBC1, starting June (times and dates of transmission to be decided). Series of six programmes about how micros can help the disabled with their employment, education and communications needs.

□*Great Experiments*, BBC 2, starting June (times and dates to be decided). Series of six programmes in which Professor Heinz Wolff recreates some of the great scientific experiments. Of particular interest to *AU* readers are Hertz's discovery of radio waves and Charles Babbage's famous Difference Engine – the precursor to the digital computer.

On radio

□*Computer World*, BBC World Service, 16.15 and 23.15 on June 17 or 01.45 and 07.30 on June 18 (times are GMT). First computer series the World Service has broadcast, offering practical advice and the latest computer news. Presented by Hamish Robertson with contributions from the ubiquitous Ian McNaught-Davis.

□*Inside Information*, BBC Radio 4 VHF, 4.30pm on Sundays. A 'self-learning' package on information technology tied in with a City & Guilds assessment course.

Blunderbox

□Loco Systems' phone number given on page 175 of the February issue should be (04862) 44800.

□In Richard Harris' listing of Sideways RAM Utilities (June issue) a few lines were inadvertently cut short:

```
20790 OPT FNequs(" About to format drive ")
20810 OPT FNequs(" Press SPACE to continue")
20920 OPT FNequs(" disc not empty")
```

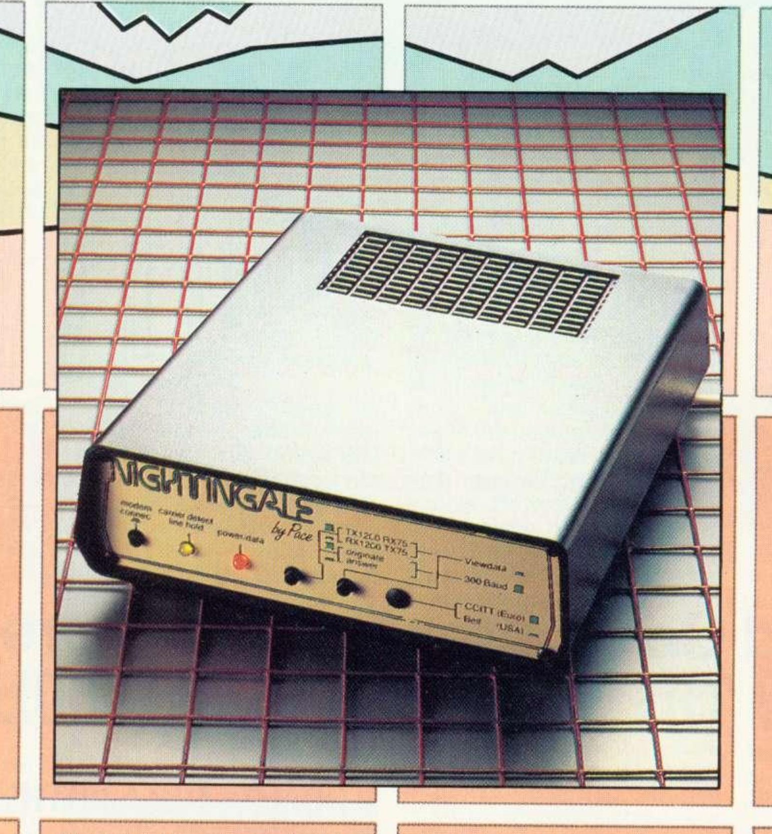
□In George Hill's *View* Printer Driver article (June issue) the numbering of the figures is wrong. Figures 1 and 2 should be combined into a single Figure 2, and the missing Figure 1 is reproduced below.

```
    This is text to try out the new printer driver.
    Normal Highlights are supported, and£a£pad£character.
    _HT1 is underline_ *HT2 is emphasised*
HT 1 130
HT 2 131
    Now ht1 should be double strike and HT2 wide print
HT 2 141
    Now with HT1 set to 141 I should be able to embed all the
following in one
    line:
    *@Underline*@ *Aemphasised*A *Bdouble strike*B *CWIDE*C
*DCondensed*D
    *ESuperscript*E *FSubscript*F *GElite*G *HProportional
Spacing*H
    *IItalic*I *JSwitch to USA set £*J and back £ again.
    And any combination of them: This is *@*I*Gelite
underlined italic*G*I*@.
    This is *B*Ddouble strike condensed*D*B.
```

Figure 1 from the View Printer Driver article (June). It shows a typical working example of all the highlight codes



NIGHTINGALE – THE MODEM



The Nightingale modem is now established as the most popular multi-baud rate modem in its class. Nightingale lets you get on with the job. Whether you need to extract information from Prestel©, send telexes via Telecom Gold, download telesoftware or simply swap files with a colleague. Did you know that you can search British Library records through their on-line system BLAISE, or access your bank account through homebanking services. The possibilities are endless.

Nightingale operates at the two most popular baud rates, 1200/75 as used by both private and public viewdata systems, and 300/300 baud for communication with remote mainframe, mini or micro systems. Also included is 'reverse viewdata mode', 75/1200 and an optional auto-answer/auto-dial board.

Approved for use in the UK and several other countries, Nightingale can be supplied with quality software for a variety of the most popular micros. If you own or use any micro with a standard RS232 interface, including the BBC micro, IBM PC, Apricot, Sirius or an Apple //e, //c or Macintosh, etc, then we may be able to help you.

With the increasing number of valuable information systems coming on-line, how much longer can you afford to be incommunicado?

Nightingale modem £119 plus VAT

Payment accepted by Cheque, Access or Visa.

Prestel is registered trademark of British Telecommunications Plc.
Pace Micro Technology, a division of Pace Software Supplies Ltd.

APPROVED for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.
S/2592/3/E/500065

SPECIAL OFFER
For a limited period we are offering **FREE** registration to **MicroLink** + **TELECOM GOLD** with every Nightingale modem.

Your BBC would not be without it

Solidisk Sideways RAM is indispensible to all BBC computers

SOLIDISK's SIDEWAYS RAM is an almost indispensible add-on for the BBC user.
It is available in either 32k, 64k or 128k byte capacity and is compatible with all issues of BBC microcomputers along with most of the add-ons and ROMs obtainable for it.
To date, more than 37,000 units have been sold.
The Sideways RAM occupies the right most ROM socket of the BBC and sits in the same position in the micro's memory map as the paged ROMs.
This means that the Sideways RAM can run almost all ROM type software including languages, utilities and filing systems.
The difference between Sideways RAM and Sideways ROM is that RAM can be written to meaning that only the presently required software has to be loaded into the machine, thus making redundant the multitude of high current consumption and often unsightly ROM extension boards.
Sideways RAM is also an invaluable tool for writing ROM type software to run on the BBC since software may be assembled straight into the area in which the final version will run. This will save a lot of time over using offset assembly and eprom programming/erasing on a non Sideways RAM equipped BBC.
For the user who is not interested in writing ROM type software but is in need of the utilities provided by the use of the Sideways RAM, we supply free software to make maximum use of the Sideways RAM facilities.
These are included in the Sideways RAM Software package, a collection of no less than 5 diskettes containing nearly 100 programs, from database, word processor, music system, sprite graphic, printer buffer, virtual memory, spelling checker, RAM disk, RAM filing system, VDU replay, disassembler, machine code monitor, macro basic, video digitised pictures etc. and Solidisk Most Advanced Disk Filing System version 2.0.
Another extremely useful feature is the ability to configure the Sideways RAM as a 'SILICON DISC' as in our STLDISC program. It makes use of available Sideways RAM as an extra disc drive.
Once the STLDISC program is loaded it acts exactly like a normal DFS with the exception that one drive is now allocated to the Sideways RAM. All operations on this drive are much faster than a physical disc drive and, of course, impart no mechanical wear to them. This means that programs may be repetitively loaded, saved, spooled or exec'd many times and only the final version need actually be saved to disc.
The extensive use of the facilities offered in the STLDISC program will allow the physical disc drives to go longer between services and the discs themselves to last longer and could in fact pay back for itself in a fairly short while.
The STLDISC program will operate on any size of Sideways RAM and will configure itself to the available space. Therefore a 16k board will give 4k bytes of storage, whereas the 32k will give 20k bytes and the 128k up to 116k bytes of 'Silicon disc' storage space.

PRICES

The listed price (effective from the 15 April onwards) comprises the Sideways RAM fully guaranteed for 1 year, comprehensive manual and a software package consisting of 5 diskettes formatted either in 40 or 80 track. Please specify when ordering.

- SWR32 (32k unit, by far the most popular): £58.95
- SWR64 (64k unit, new introduction model): £85.00
- SWR128 (128k unit, the second most popular): £149.00

As Solidisk Software Support Service has to produce in excess of 16,000 diskettes every month, we regret that we can no longer provide personalised service for disk copying. In extreme cases, when you need to update your software diskette, either reorder a new software package (which is always sold to you at nominal media cost (plus post and packing) or return the old package with £2.00 to cover post and packing. You may avoid post and packing costs if you call at Solidisk's stand at any BBC micro exhibition or at the Solidisk office.

UPGRADING

Upgrading from a smaller model is very simple: you return the old RAM board to us with your payment.
The listed prices include the full software package and new manual.

THE SOFTWARE PACKAGE

The Software package comprises of 5 diskettes, formatted either in 40 or 80 track. Please specify when ordering.

Volume 1:
Volume 1 contains all the general applications of Sideways RAM such as load and save ROMs (the Menu program), printer buffer (the Printer program), Improved Disk Filing System with unlimited catalog or PAGE at &E00 (STL0E00 and 2.0 ROM), Silicon Disc (the STLDISC program), the Quickcopy and the Fast Backup programs which use Sideways RAM to save you time and disk swapping effort.

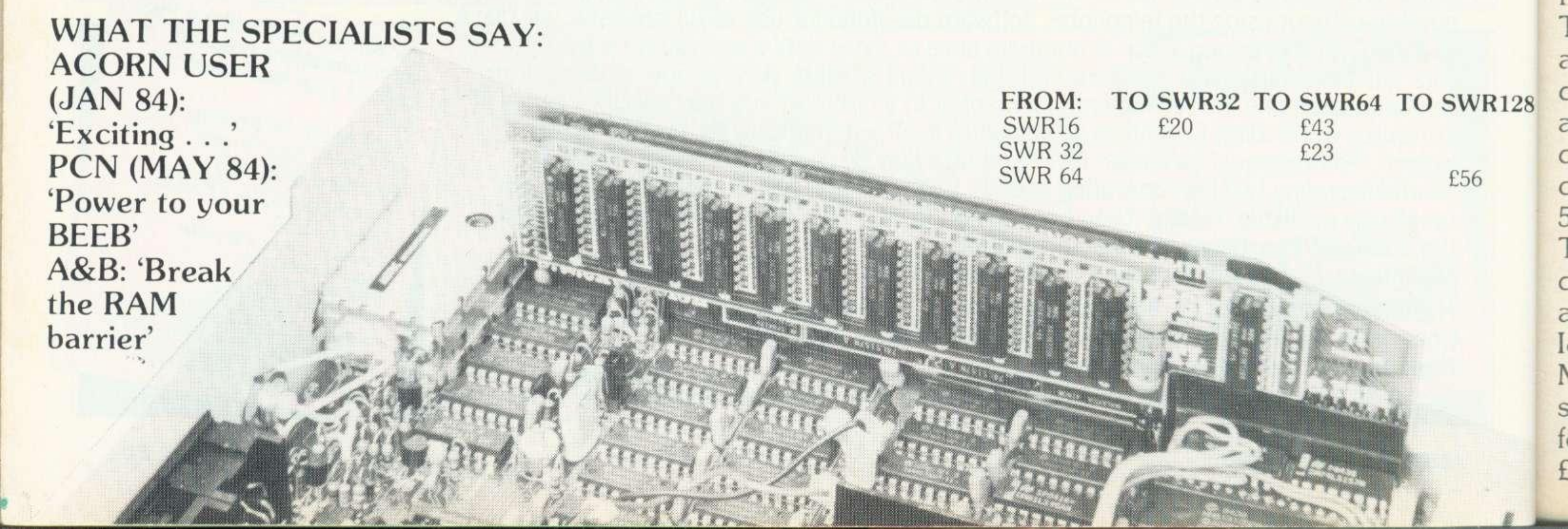
Volume 2:
Volume 2 contains the Wordprocessor, Spelling Checker and the English Dictionary.

Volume 3:
Volume 3 contains the Macro Basic (a program generator), a Linker-Editor and the Virtual Memory Program, which lets you use Sideways RAM to store Basic programs thus allowing otherwise too large programs to run.

Volume 4:
Volume 4 contains a suite of programs, all part of the Solidisk Database system. This Database allows you to retrieve any record of up to 6500 records quicker than you can remove your finger; each record can have up to 15 fields of up to 60 characters long. 15 utilities are included allowing printing of forms, tabulation, mailmerge, maths etc.

Volume 5:
Volume 5 contains extensive programming aids such as the powerful Solimon, the 65C02 assembler, the Solitrace, a dual screen tracing utility, the Invisible trace, the Sprite and Sprite generator capable of moving 32 sprites anywhere in a single picture frame, the VDU Recorder, which mimics a £10,000 graphic computer and more.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).



WHAT THE SPECIALISTS SAY:
ACORN USER (JAN 84): 'Exciting . . .'
PCN (MAY 84): 'Power to your BEEB'
A&B: 'Break the RAM barrier'

FROM:	TO SWR32	TO SWR64	TO SWR128
SWR16	£20	£43	
SWR 32		£23	
SWR 64			£56

Introduced only last November the SOLIDISK DDFS has enjoyed an unprecedented popularity in a very short time. We think the reason for this is the ease and simplicity of installation and use, along with the capability of 60% extra disc capacity in the Double Density mode. This coupled with realistic pricing makes our DDFS an absolute best seller.

WHICH DFS DO YOU NEED?

SOLIDISK produce no less than three types of Disc Filing Systems to cover all your requirements.

1. THE FLEXIBLE DDFS

The basic SOLIDISK DDFS (£38.95) is suitable for all ordinary users. It is supplied with the SOLIDISK 1.9 ROM. This ROM is compatible with the ACORN DFS; running all unprotected commercial software and disks from Acornsoft (Elite), Micro Power (Castle Quest), Island Logic (The Music System).

The 1.9 ROM offers both single and double density formats, with built in disc formatter and verifying, along with such features as automatic density sensing and 40/80 track software controlled switching. The speed is now programmable by the keyboard links to suit almost any type of disc drive and the maximum file size is now only limited by the capacity of the disc.

The DDFS can now be supplied with the Solidisk Most Advanced Disc Filing System (our 2.0 ROM). The total price of this system is £48.95 and the specifications are outlined below.

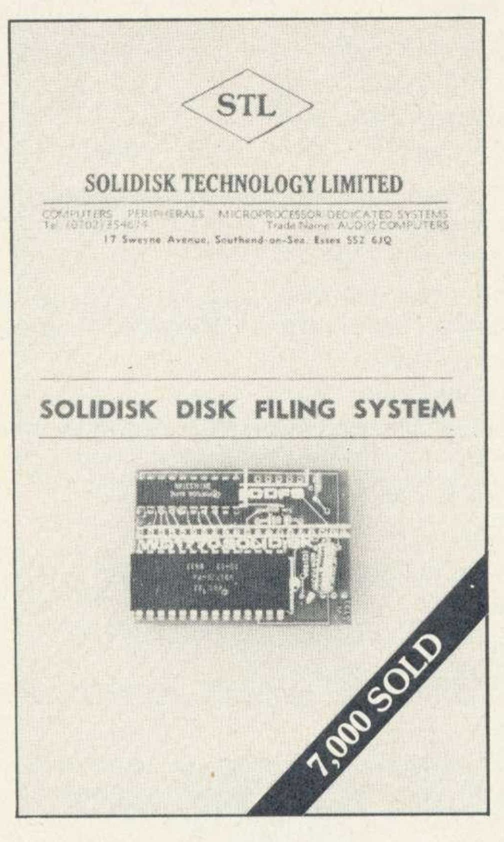
2. THE FAST 8″ CONTROLLER

This a totally new product intended for the business user where speed and reliability are paramount.

The date transfer rate of the 8″ look alike is double that of a standard 5.25″ double density formatted disc or an amazing four times that of a single density formatted disc. This gives a data transfer at the incredible speed of 500kbits or 64 k bytes a second.

This DDFS can be used with either 8″ disc drives or the Mitsubishi 8″ look alike or a mixture of the two.

Ideally suitable to be used with the Mitsubishi M4855 80 track double sided (2 MB unformatted or 1.3 MB formatted), the 8″ DFS costs only £69.95 inclusive.



3. THE SEDUCTIVE DFDC

Ideally suitable if you already have an Acorn DFS. The DFDC will not only add Double Density capability but also improve the speed of your 8271 chip. The SOLIDISC DFDC (Dual Floppy Disc Controllers) is making a very large impact on the BBC user community with its extraordinary capability. It is currently supplied with the Solidisk Advanced Disk Filing System ROM 2.0 (£54.95).

The DFDC board simply sits in the place of the 8271 FDC chip (i.c.78) in the BBC. The 8271 is then inserted into the DFDC board and the ROM 2.0 inserted in place of the original DFS ROM.

Once the machine is up and running it is then simplicity itself to change FDCs; just throw the switch attached to the DFDC board, press BREAK and the other FDC is now selected.

This allows the user to get the best facilities available from both the 1770 and 8271 floppy disc controller chips with the minimum of fuss.

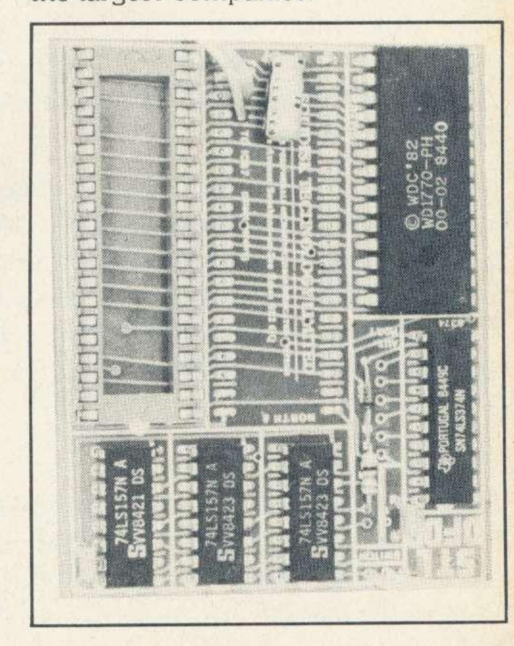
The DFDC board may also be used as a Stand Alone DFS if your BBC is not yet upgraded for disc systems. All the necessary chips and instructions are supplied and the 8271 may be added as an optional extra at a later date.

The SOLIDISK DDFS is now the ultimate in reliability with a minimum component count and software error trapping.

The DDFS consists of only 4 components to be plugged in to the BBC Microcomputer and can be fitted in just a few minutes by novice and expert alike.

Whilst many other manufacturers rely heavily on distribution outlets to do the selling for them, SOLIDISK relies on a good product and a large support network to win the heart of the user. With over 60 local experts, covering England, Scotland and Wales, a SOLIDISK National User Group in Holland and soon in Australia, SOLIDISK can offer many users regional free fitting and advice. Also with an ever increasing catalogue of free software, available to all SOLIDISK users, comprising of Programming tools, Graphic windows, Musical tunes, Spelling checker, Computer Aided Design, Disc utilities etc., even users who are new to the DDFS can expect to build up a large disc program library in a fairly short time.

Solidisk Software Support Service now has a responsibility to over 35,000 users and the ability to give you the best possible support matched only by the largest companies.



SOLIDISK TECHNOLOGY LIMITED
17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ
TEL. SOUTHEND (0702) 354674 (10 lines)

SOLIDISK DFS ROM 2.0 IS OUT:

The Solidisk Advanced Disk Filing System for the BBC computer is now available for both Solidisk DDFS users and Acorn DFS users as an upgrade for the DNFS 1.2ROM.

Standard features include:

1) Unlimited Catalogue entries (up to disc capacity) without any special preparation.
With Computer Concepts's Disc Doctor or Watford's DFS, you have to specify BEFORE formatting if you want 62 filenames. Once formatted, you can no longer modify the format.
With ROM 2.0, there is no limit to the number of files and programs you can have on the same diskette. Until it is completely full.

2) Unlimited filesize.
This feature is sometimes a very good sales argument for databases.

3) Automatic Write Error Correction.
Every disk write operation is immediately followed by a read operation to ensure that the recorded data is free of all errors. Then if needs be, ROM 2.0 will restart the write operation from the unsafe sector.

4) Automatic 40/80 track stepping.
No other DFS allows you to directly backup a 40 track disk to an 80 track disk, even if you have a switchable disk drive, since the hardware cannot replace the software! ROM 2.0 allows you to backup and copy any 40 track disk to 80 track, single to double density (if available) even on the same drive without any special care.

5) DISC REPAIR FACILITIES.
Disc sector editor (*DZAP), memory editor (*MZAP), recover good sectors (*RECOVER), re-write multiple sectors (*RESTORE), Read disk format (*R40 and *R80), recover bad sectors and bad track (*RTRACK), repair and restore bad sectors and track (*WTRACK) and the powerful disc copy (*DCOPY) which is capable of duplicating even some non BBC disks in under 1 minute in both single and double density (if available).

6) Tape to disc facilities.
This facility allows automatic transfer of all programs and most games to disk (*TAPEDISC and *LOADTAPE). Only in some cases (multi-part game cassettes), will you need Clare's utilities.

7) Wordprocessing facilities.
This facility allows !BOOT and other text files to be edited, saved and printed. Any screen mode and text up to 24k can be handled.

8) PRICE
The 2.0 ROM costs £20.00 to all Acorn DFS users. Included in the price are the Advanced DFS User Manual and VAT.
As an upgrade for the 8k Solidisk DDFS 1.9, the price is only £10.00 inclusive. Please note that you do not have to send back your present DDFS ROM when ordering, but post it later in the return envelope sent together with the 2.0 ROM, quoting your credit card number as a guarantee.

SOLIDISK KEYBOARD AND CPU ARE NOT JUST PRETTY . . .

The keyboard is 12 mm lower than the normal BBC case, 2-3 degrees more angled, weighs only 5lbs, does not skid about on the desk while enjoying 2 feet of freedom from the computer unit — and makes a lot of difference to the typist (even 2 fingered ones!).

The CPU accommodates 2 disk drives and withstands any heavy weight monitor while providing easy attachment for the whole system, CPU and disk drives, to the desk if need be. There is good ventilation to the power supply too and all untidy cables are hidden away.



PRICE

The complete CPU and keyboard case costs £30.00 inclusive + £3.00 post and packing. The system could be yours free as part of the Mitsubishi twin discs offer. Actually the best thing that happened to the BBC computer for a long time!

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

SOLIDISK + MITSUBISHI BIG DEAL:

THE MITSUBISHI 640K DISK OUTFIT:
This offer comprises:

— One Double Sided, 80 track Mitsubishi M4853 disk drive, cased in beige.
— One Solidisk DDFS Single and Double Density Disc Upgrade.
— All leads and manuals (2).
— One Software package comprising 5 program diskettes as detailed below.
— Full one year guarantee.
— All for £209.95 inclusive of VAT and carriage.

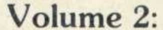
IMPORTANT
If you upgrade (now or later) to twin Mitsubishi M4853 disk system, Solidisk will offer you, subject to stock availability, absolutely free a CPU and keyboard case as shown earlier.
For that, you have the choice of ordering a 640k Mitsubishi disk outfit now and then later on, of returning your disk drive, enclosing payment of £160 to cover the second disk drive and carriage. Alternatively, save by ordering right now a complete twin Mitsubishi (2MB unformatted, 1.3 MB formatted) Fantastic Offer at only £359.95 inclusive.



THE HARDWARE:
As described earlier as shown opposite.

THE SOFTWARE:
The software comprises 5 diskettes, formatted in 80 tracks. Volume 1 contains the Word Processor, Volume 2 the Database, Volume 3 the new Spreadsheet 1.1, Volume 4 the disc, tape utilities and a blank dictionary.
It would take several pages to describe them all. In general, they are of the highest standard as our hardware products. Only the first 2 volumes will be described below.

Volume 1:
Solidisk Word Processor and Spelling Checker with English dictionary. Easier than View, Wordwise or Scribe, you enter the WP by *WP (filename), then start typing. What you see on the screen will be exactly printed on paper.
You don't even need to read the manual twice, the most useful commands are all displayed on the top part of the screen.
This Word Processor features 80 column screen throughout, direct on screen justification, automatic margins, page numbering, printer special commands, Wordstar like editing commands for block move, block delete, block copy, print, save, load text to cursor, insert and overwrite, search and replace, total word count, word frequency count, free space, * commands etc, etc.
Solidisk WP loads and saves texts under 1 second flat and also you may save the edited version as many times and under any filename you like.
And also better than any other wordprocessor, you can spell check your document without leaving it, simply type in Control-U.
It has self dictionary generating capability too. You may create any dictionary you like simply by entering the words.



Solidisk WP is also excellent as a training tutor for Wordstar, as used on most 16 bit computers.

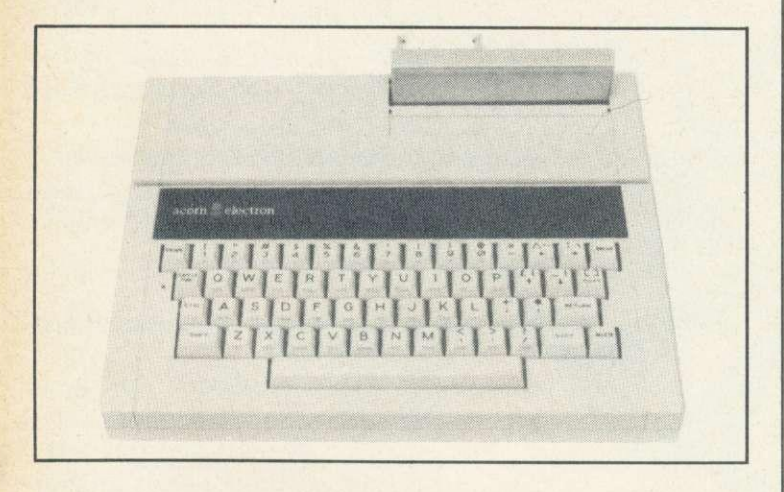
Volume 2:
Solidisk Database. Solidisk Database is a random access system, completely menu driven and more importantly, very easily customised to suit any particular need.
Important features include unlimited filesize and number of records, all maths functions and 80 column screen throughout. Solidisk Database is particularly simple to understand and easy to use. You are first presented with an option menu, which comprises 15 different options. Each option will then lead to a new menu and so on. Mostly you only have to enter an appropriate data or hit the RETURN key.
You can design a new database, list all records, edit them, merge them, split them, making mailshot with Solidisk WP etc. For instance, Solidisk telephone enquiries are dealt with by an ordinary BBC with twin Mitsubishi holding the last 4000 sales records. Typing in the name you retrieve the complete record quicker than you can remove your finger. It of course runs Solidisk Datafile.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

NEW PRODUCT ANNOUNCEMENTS

Solidisk MODEM.
Single chip FSK, Multistandard internal MODEM, requires no soldering, no adjustment.
Supplied with Menu Driven SoliComms 16k ROM, ready to be connected to any information provider such as Prestel or Gold.
Auto dialling, auto answer, auto baud rate, auto error correction.
Available soon. Price: £39.95 inclusive.

Solidisk Third Processor
Internally fitted 6502 compatible with Acorn Second Processor, 128k as standard, upgradable to 256k, 4 Sideways ROM sockets, software supplied in ROM allowing unused RAM to be loaded with Sideways Software or used as Silicon Disk. Available soon.
128k 6502 TP: £179.00 inclusive.
256k 6502 TP: £229.00 inclusive.



IN STOCK:

1) NEW LOW PRICE EPROMS.
2764s and 27128s are going down in price.
5 x 2764s now cost you only 24.95 per pack.
3 x 27128 now only 25.95 per pack.

2) PLENTY OF UVIPROMS AND UVIPACS.

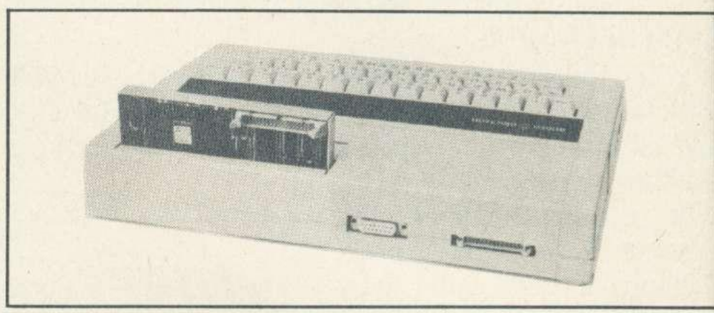
3) ELECTRON DISK INTERFACE.
This interface is BBC compatible and includes 3 Sideways ROM sockets.
It Plugs into the PLUS-1 and allows direct attachment of disk drive and software compatibility with BBC disks.

PRICE: £39.95 inclusive, P&P: £1.00.

SOLIDISK LOCAL EXPERTS

We have people able to fit your equipment free of charge in all the following towns. If your area is not mentioned, ring the office!

Dunstable, Leighton Buzzard, Reading, Peterborough, Wimslow, Penzance, Torquay, Wimborne, Basildon, Stroud, Southampton, Hoddesdon, Watford, Bexley, Margate, Rochdale, Boston, London (all areas), Oldham, Hunts Cross, East Dereham, Rushden, West Bridgford, Wantage, Bambury, Grimsby, Kingston, New malden, Woking, Taunton, King Norton, Sutton Coldfield, Halesowen, Leamington Spa, Hassocks, Salisbury, Swallowne, Leeds, Huddersfield, Treowen Newtown, Newtownards, Co Fermanagh, Co Londonderry, Le Mesnil St Denis (France), Kalgoolie (Australia), Paramatta (New Sth Wales), Manawatu (New Zealand).



Short form price list. Full price list on request.

Qty Items	Prices	P&P
Sideways RAMs:		
SWR32	£58.95	£1.00
SWR64	£85.00	£1.00
SWR128	£149.95	£1.00
CPU & Keyboard Case (both)	£30.00	£3.00
Solidisk DDFS.		
DDFS (with 1.9 ROM)	£38.95	£1.00
DDFS (with 2.0 ROM)	£48.95	£1.00
DFDC (with 2.0 ROM)	£54.95	£1.00
8" Controller	£69.95	£1.00
Special Offers.		
640k Disc Offer	£206.95	£3.00
1.3MB Fantastic Offer	£356.95	£3.00
Eprom Equipment.		
Programmer	£19.95	£1.00
Eraser	£19.95	£1.00
2764 x 5 new low price	£24.95	£1.00
27128 x 3 new low price	£25.95	£1.00
Datalife Diskettes.		
MD525 SS/DD	£17.00	£1.00
MD550 DS/DD	£22.00	£1.00
MD557 2S/4D	£28.00	£1.00
65C02 with Software	£13.00	£1.00
Solimon-2 16k ROM	£13.00	£1.00
2.0 DFS 16k ROM	£20.00	£1.00
Total =		

Name:

Address:

Barclay/Access:

Prices and specifications correct at time of going to press: we do reserve the right however to change without prior notice.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

SOLIDISK TECHNOLOGY
Mass storage

XD20-40

PRELIMINARY

SOLIDISK XD20-40 WINCHESTER DISK SYSTEM.

Based on the Western Digital WD1002-SHD hard disc controller and Mitsubishi MR522 Winchester mechanism, the Solidisk XD20-40 Winchester model offers 20 Megabytes (26MB unformatted) of net storage at only £699.00 + VAT, and that includes SOLIDISK ADVANCED DISC FILING SYSTEM and supportive software package (Database, wordprocessor, spelling checker, Spreadsheet and utilities.)

Upgrading to 40 Megabytes is by adding a second MR522 and new power supply unit at only £440 + VAT.

Higher capacity of up to 130 MB is also possible by replacing the MR522 with higher capacity drives.

GENERAL DESCRIPTION

The Solidisk Winchester system meets or exceeds Acorn Winchester standard.

(1) EASY TO INSTALL.

The Winchester System is supplied with free CPU and detachable keyboard case. It is connected to the BBC computer via a flat ribbon cable to the 1MHz Bus. Controlling software (STL ADFS) is supplied in one 32k or two 16k ROM to be fitted into any ROM sockets on the BBC computer.
If floppy disc drives are also needed, the Solidisk DDFS or DFDC floppy disc interface must also be installed.

(2) EASY TO USE.

The controlling software (STL ADFS) is flexible and intelligent. It automatically reconfigures itself to offer to the application software one of 2 familiar environments: the old DFS format or the new Acorn Advanced DFS format.
The STL ADFS also controls your floppy disk drives in single and double density, can run most software without any modification, including tape based games.

(3) EXTENSIVE DISC FORMATTING CAPABILITIES.

The STL ADFS works with all Acorn Disc formats, Single Density, ADFS double density, Winchester and Solidisk own double density floppy format.
It will automatically copy diskettes from any format to the same format or any other format.

(4) VERY HIGH SPEED OF OPERATION.

Solidisk Winchester system can load a complete 32k program in under one second.
Greater speed not only means that your programs will load and run faster, but also extends the useful life of the disc drive.

(5) SOLIDISK ADFS AND DATABASE APPLICATIONS.

Solidisk ADFS is doted with special features to run database applications faster. In particular, up to 10 channels can be opened simultaneously without buffer page swapping and files opened for output may have a declared size to avoid compaction and data fill etc. . .
Solidisk also supply free Winchester versions of its versatile business database program as used by our company.
For example, you may use Solidisk Datafile to process 50,000 mail orders on a single 20MB system.

(6) SOLIDISK GRAPHIC BASE.

Also free is an innovative SOLIDISK GRAPHIC DATABASE (Solidisk 128K or 256k Sideways RAM system is required).
Graphic Records are used as SPRITES, you can define, edit, search, sort and print them as you would do with Solidisk Database.
Solidisk Graphic Base is probably the most user friendly approach to CAD.
Solidisk Winchester system is ideal for use in businesses, book writing, Teletext and Prestel information automatic logging, for doctors, librarians, technicians etc. . .

(7) PRICES.

BASIC XD20-40 SYSTEM .... £699.00 + VAT
Comprising BBC Sasi Interface, WD1002-SHD, one Mitsubishi MR522, all leads software and manual.

XD20-40 SECOND DRIVE .... £440.00 + VAT
Mitsubishi MR522, PSU and all leads.

LOW COST 5MB SYSTEM .... £499.00 + VAT
Fitted with new drive but of unspecified origin.

Higher capacity drives can be supplied on request.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).



Oxford Computer Systems (Software) Ltd.
Hensington Road, Woodstock, Oxford OX7 1JR, England
Telephone (0993) 812700 Telex 83147 Ref. OCSL

Compilers like these don't grow on trees

Oxford Pascal is Fast

Oxford Pascal compiles down to FAST COMPACT P-code, giving you the real speed and power of Pascal, together with the ability to compile very large programs.

Oxford Pascal is Standard

Oxford Pascal is a full extended implementation of Standard Pascal. This means that you can compile any Pascal program (subject to size), written on any computer, anywhere.

Oxford Pascal is Compact

Because it compiles into P-code, Oxford Pascal reduces programs into the most compact form possible. In fact it allows you to pack more code into your BEEB than any other language, and should your programs become too large, you can still use the CHAIN command to overlay limitless additional programs without losing data.

Graphics & Sound Extensions

In addition to the entire Pascal language, Oxford Pascal features a whole range of Graphics (all modes) and sound extensions designed to make maximum use of the BBC Computer. Oxford Pascal also provides numerous extensions such as hexadecimal arithmetic and bit manipulation instructions.

Oxford Pascal in Education

In Education, Oxford Pascal is fast becoming a *de facto* standard. It is already the most popular Pascal on the Commodore 64, and will soon be released for the Spectrum and the Amstrad. In fact, Oxford Pascal will soon be available for 90% of the computers installed in the U.K., and is already available in German, French, Swedish, and American versions. **Students and teachers alike find that it makes sense to use a standard implementation of Pascal across the whole range of educational micros.** Call us for details of our generous educational discounts.

Manual

Both these compilers come with a manual which has been carefully designed, not only as a quick reference guide, but also as a full tutorial for those new to Pascal.

Resident and Disc Compiler

Oxford Pascal comes in two forms:

For Tape Users...Oxford Resident Pascal. A compiler located largely in ROM which is available at any time. Programs can be written and compiled on the spot without disc or tape access, and compilation is fast enough to make using the compiler much like using the BASIC interpreter. Thus, learning Pascal is a simple interactive process. Some 15K of memory is available for user programs, the remainder being reserved for compiled object code.

For Disc Users...Oxford Disc Pascal offers all the above PLUS...a full disc compiler which is capable of using the WHOLE memory for Pascal object code, it is supplied with a powerful LINKER, allowing you to break large programming tasks down into separately compilable, easily-manageable files.

Friendly Error Messages

Many compilers produce little more than an error and line number to help correct mistakes in Pascal programs. Oxford Pascal however, gives you one of 49 friendly and informative error messages. Messages which not only indicate the reason for an error, but also print out the line in question with a pointer to the exact position where the error was detected.
Run-time errors are reported using line-numbers from the original source-program, with a full explanation of how the error occurred.

Powerful Editor

With Oxford Pascal there is no need for you to learn how to use a new Editor. Pascal programs can be entered in exactly the same way as BASIC programs, without the need to learn any new commands. When you are used to using Pascal, you will find our extensions to the Standard Editor even more useful. What is more, Oxford Pascal allows you to mix BASIC and Pascal together, in much the same way that you can mix BASIC and assembler. In fact you can, if required, mix all three together...BASIC, Pascal and assembler...in one program.

Stand Alone Code

Unlike other compilers, Oxford Disc Pascal allows you to compile on the BBC and then relocate your program so that it will run on the BBC. The relocated program will run without a Pascal **ROM** and can be loaded and run from tape or disc just like any other program.

This means that you can distribute or sell your software freely and without the need for **ROM**s, to run either of the above machines.

Price/availability matrix

	BBC 'B'	C64	SPECTRUM
DISC	£49.95	£49.95	Available soon
CASSETTE	£39.95	£22.95	

All prices are inclusive of VAT
Please add £2.00 for postage and packing.

Oxford Compilers — The Future

During the next year, we at Oxford will be releasing a series of language implementations such as C, and Modular 2, for the BBC, and other popular micros.

These compilers are being built, using the most modern techniques in **automated** compiler construction, and will bring to the micro-user, a level of robustness and efficiency, only now becoming available to mini and mainframe users.

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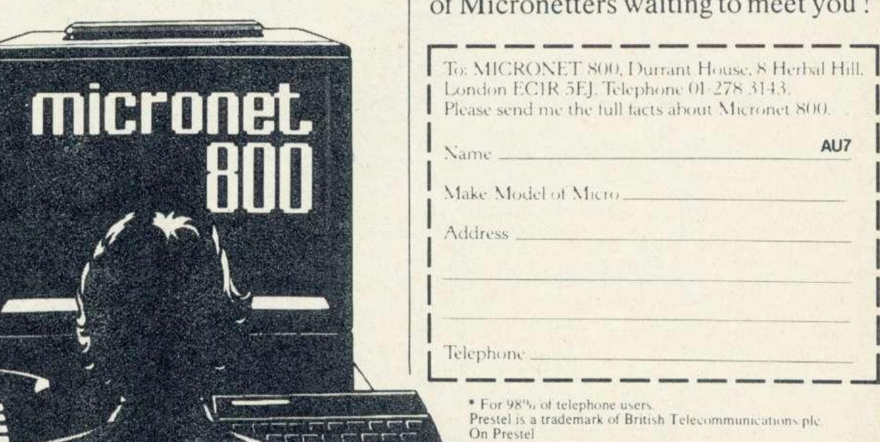
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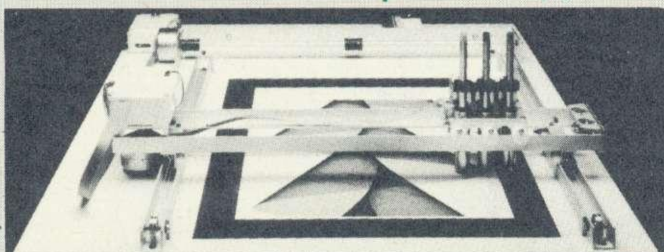
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EPSON HI-80 PLOTTER

EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time — upto 10 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, ellipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer. Detailed leaflet on request. **£399 (a)**

PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

TSB 64 Buffer/Sharer **£245(a)**
BBC Cable Set **£30**

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No external power input required.

All lines on the sharers are fully switched (36 on parallel and 25 on serial)

	Parallel	Serial
3 Computers to a Printer	36V36-3 £69(c)	25V25-3 £64(c)
4 Computers to a Printer	36V36-4 £85(c)	25V25-4 £74(c)
2 Computers/2 Printers X-over	36V36-X £69(c)	25V25-X £69(c)
BBC Cable Set 3 to 1 (1m ea.)	£32(c)	£34(c)
BBC Cable Set 4 to 1 (1m ea.)	£39(c)	£41(c)

Computer Sharer:
1 computer to 2 printers fitted with Cable for BBC TCS26 **£19.50(c)**.

GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 x 192mm + menu area. Comes complete with a CAD package. **£110(b)**.
DDX software **£99(b)**.

Techno-Line 24HR VIEWDATA SERVICE
Tel: 01-450 9764

01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

MONITORS

All monitors supplied with BBC lead

MICROVITEC

All 14" monitors now available in plastic or metal cases, please specify your requirement.

14" RGB		with PAL & Audio	
1431 Std Res	£185(a)	1431 AP Std Res	£205(a)
1451 Med Res	£240(a)	1451 AP Med Res	£280(a)
1441 Hi Res	£389(a)	These monitors can receive TV programs thru a Video Recorder	

Swivel Base for Plastic 14 Microvitecs **£20(c)**

20" RGB with PAL & Audio

2030CS Std Res **£380(a)** 2040CS Hi Res **£685(a)**

KAGA TAXAN 12" RGB

VISION II Hi Res **£225 (a)** VISION III Super Hi Res **£325 (a)**

SANYO CD3125NB 14" RGB Std Res **£169 (a)**

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12" Green Screen	£90(a)
KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1202A Hi Res 12" Etched Amber Screen	£105(a)
PHILIPS DGD Hi Res Green Screen	£75(a)
ZENITH 122 Hi Res 12" Amber Screen	£68(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)

BBC Leads Kaga RGB **£5(d)** Microvitec **£3.50(d)** Monochrome **£3.50(d)**

RB2 TRACKER BALL



This is a precision built tracker-ball using a freely rotating resin ball. Three switch buttons enables easy software manipulation to incorporate the use of the tracker ball. Appropriate software will enable the RB2 to take over the functions of cursor keys in word processing, CAD/CAM applications and two dimensional positional positional controls of robots, drillheads etc. RB2 which plugs into the user port is supplied with utility programme to use it as a joystick with other software, a comprehensive graphics/CAD program and a program demonstrating its editing capabilities. User guide includes instructions on writing your own programs for the RB2. **£52(b)**

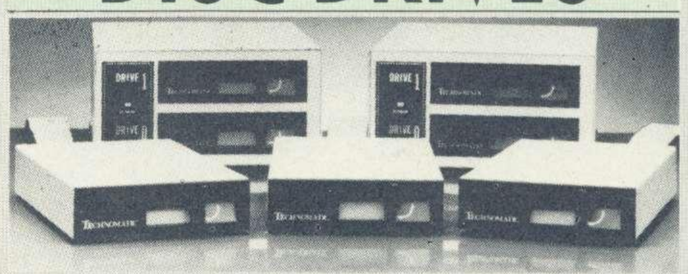
AMX MOUSE

In conjunction with a controlling ROM this sophisticated mouse has many advanced features such as Icons, Windows etc., these can be used in ordinary programs as well as sophisticated CAD Design. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. **£69(b)**

AMX DESK — An organisational program, including memo-pad, telephone/address book, diary, alarm, calculator etc. On Disc **£22(d)**

AMX UTILITIES — provides new drawing facilities including Zoom, colour sketch and more. On Disc **£13(d)**

DISC DRIVES



TECHNOMATIC drives are fitted with high quality slimline Mitsubishi mechanisms and represent the state of the art in drive technology. The drives are built to the highest standards and are tested to their full performance capability before packaging.

All drives are available with or without integral mains power supply. The dual drive power supplies are switch mode type and are generously rated to ensure minimum heat generation even over long periods of operation. All drives with integral power supply are fitted with a mains indicator.

The drives are housed in attractively designed metal casings painted in hard wearing BBC matching paint. The dual drives can be supplied in stacked version or with built-in plinths. The plinth version cases are of sturdy construction to carry any monitor and provide a simple method of having a compact computer installation.

The 80T drives are supplied with the 40/80 track switching modules at no extra charge. The 40/80 track switches are conveniently positioned to enable easy switching between the tracks.

All drives are supplied with all the necessary cables, manual and a formatting disc. The mains powered drives are also fitted with a 13A mains plug suitably fused. The drives are ready to be fitted to the computer. All drives are capable of operating in single or double density modes.

Single Drives:

1 × 100K 40T SS	TS100	£85(b)	PS100 with psu	£125(b)
1 × 400K 80/40T DS	TS400	£125(b)	PS400 with psu	£149(b)

Dual Drives:

Stacked Version:				
2 × 100K 40T SS	TD200	£175(a)	PD200 with psu	£200(a)
2 × 400K 80/40 DS	TD800	£250(a)	PD800 with psu	£290(a)
Plinth Version:				
2 × 100K 40T SS	TD200P	£195(a)	PD200P with psu	£220(a)
2 × 400K 80T DS	TD800P	£265(a)	PD800P with psu	£305(a)

DISC DRIVE MULTIPLEXER

A simple device that enables up to four computers to be connected to one single or dual drive. Ideal unit for installing in classrooms where networking is not planned or necessary or the costs have to be kept low or where software information is shared. Several of these units can be installed in series to connect more computers to access the same discs. Units supplied with 5' of cable per outlet as standard. Mains powered.

TDM 4 Quad Unit (upto 4 computers) **£135(a)**
TDM 2 Dual Unit (2 computers) **£75(b)**

Note: All computers must be fitted with a DFS

3M FLOPPY DISCS

Authorised Distributor
Data Recording Products



Industry standard high quality discs with guaranteed error free performance for life. Discs in packs of 10:

40T SSDD **£13(c)** 40T DSDD **£18(c)**
80T SSDD **£22(c)** 80T DSDD **£24(c)**

3½" discs. Pack of ten £38(c)

FLOPPICLENE DRIVEHEAD CLEANING KIT

The FLOPPICLENE drive head cleaning kit is an ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminates the risk of contamination and abrasion of sensitive driveheads. These risks are normally inherent in the reusable drivehead cleaning kits. Floppiclene with 20 disposable cleaning kits. **£14.50(b)**

DISC ACCESSORIES

Single Disc Cable **£6(d)** Dual Disc Cable **£8.50(d)**
10 Disc Library Case **£1.80(d)** 30 Disc Case **£6.00(c)**
Lockable Storage Boxes 40 Discs **£14(c)** 100 Discs **£19(c)**

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Telephone: 01-208 1177. Telex: 922800

COMMUNICATIONS

MODEMS

ACORN PRESTEL: The official Acorn add-on — an advanced BT Approved. Auto-Dial, Prestel Terminal ideal for British Telecom Gold. Comprehensive software includes 'tagged' frames, downloading of Telesoftware, saving of frames, printing, sophisticated 'Mailbox' handling c/w editor. A built-in speaker allows line monitoring. A simple !BOOT file allows automatic operation **£99(b)**

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as Intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered **£62(c)** BBC Lead **£6** External PSU **£9(c)**

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21, V23, (BELL 103/113/108 outside the UK) and including 75,300,600,1200 Baud ratings. (It even includes 'reverse Prestel'!). This is the modem that will cover 'Prestel' type systems as well as Bulletin Boards both in the UK and abroad. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto-dial/auto-answer makes this modem unique. WS2000 **£129(c)** BBC Serial Cable **£7**



WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line **£30(d).**
BBC User Port cable (for modem control) **£7.**
SKI KIT (Allowing total control of the modem by your computer) **£10.**
DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling **£10.**
WS2000 Auto-Answer Card £30(d).
(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. All input may be copied into a buffer in memory over which full control is available. Controls of protocols are very simple and any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time-clock. **£29(d)**

TERMI-II A good general purpose communications package for bulletin boards, electronic mail etc. (Not for PRESTEL) **£28(d)**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£59(d).**

'TIME-WARP' REAL-TIME CLOCK CALENDER

We have broken the price barrier! A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as Extensive software on cassette (easily transferred to disc) — no ROMs needed. **£29(c)**



SMARTMOUTH

The original 'infinite speech' synthesiser. A ready built, self contained speech synthesiser unit attractively packaged with a built in speaker. Plugs into the user port. **£31(c)**

TECHNOMATIC

All prices exclude VAT

EPROMER II

A sophisticated eprom programmer that handles the full range of single rail eproms (incl 27256) and allows the user full control of the programming process.

Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

* Integral power supply ensures no power drain from the computer.
* Interfaces through 1 MHz bus, fully buffered.
* Eproms upto 16K (27128) programmed in single pass.
* Selectable programming voltage 25/21/12.5V
* Selectable programming method — normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses with FF data to increase programming speed. Automatic verification on completion of programming.
* User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
* Full screen editor with HEX/ASCII input.
* Full tape/disc filing facility. Data input from keyboard/Tape/Disc/Eprom.
* Constant display of all options selected.
* Several BBC BASIC programs can be entered on a single eprom.

EPROMER II with Manual & Cassette **£99(b)** Software on disc **£3**
ROM based software **£10**

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59(b).**
UV1T as above but without the timer. **£47(b).**

ROM/RAM EXPANSION SYSTEMS

COMPUTER VILLAGE ROM/RAM BOARD: A beautifully designed expansion board, simply plugs in — no soldering. (Fits into 6502 and Video ULA Skt.). Fully buffered with 16 paged Rom capacity. Option of 16K paged Ram, with software initiated write protect — battery backup is included. It allows nine different ROM/RAM configurations. **£43(c)**

ATPL SIDEWISE ROM EXPANSION BOARD: This is a well constructed expansion board, that does not require soldering in its installation. All buses are buffered. It allows full sideways ROM expansion to a total of 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K byte CMOS RAM chips, giving a total of 16K sideways RAM. This is ideal for sideways ROM development, and will also allow downloading of software from cassette or disc. The battery backup option will allow retention of data in the RAM, when power to the computer is removed. Several link-selectable options include the choice of type of Eprom, and a 'write-protect' for the RAM option. **£39(d)** Back-up Kit **£18.**

RAMROM-15: The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. **£86(b).**

17 Burnley Road, London NW10 1ED
Telephone: 01-208 1177. Telex: 922800

Techno-Line 24HR VIEWDATA SERVICE
Tel: 01-450 9764

01-208 1177

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THE SCROLL

We are about to launch a revolutionary new concept in Word Processing, that will raise the standard of BBC word processors.

Among its revolutionary features are:

1. A supplied 64K ram card allows a genuine 64K of text storage.
2. 40/80 Column use is easily selectable.
3. A special non-volatile 2K ram, stores (even when the BBC is switched off!) both pre-defined document configurations, and pre-defined printer drivers. This allows you to take full advantage of many and varying printer facilities, such as Italics, Bold, Underline, Shadow etc., with ease and simplicity.
4. A unique facility allows user access to the 64K Ram and 2K Non-volatile RAM.

Not priced for the lower end of the market, this product is aimed primarily at the professional user who spends a considerable period of time using a word processor, and is not satisfied with 'hobby' type products. We feel that we have reached a high standard with this product — that it has achieved the delicate balance between sophisticated features and an elegant ease of use.

Detailed specifications to be released soon.

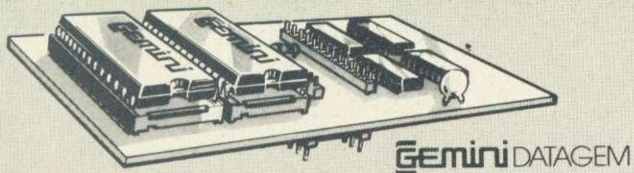
ACORN IEEE INTERFACE

This interfaces enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. **£282(a)**

ACORN MUSIC 500

Convert your BBC micro into a sophisticated music composition aid and sound effects generator. Custom made software will provide you with the flexibility to compose, experiment, perform and teach music. Stereo output can be connected to a sound system including your home stereo unit. Full specification on request. **£174(a)**

DATABASE MANAGEMENT SYSTEMS



The Definitive Random Access, 24K ROM Based DATABASE MANAGEMENT SYSTEM.

Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: *almost unlimited file size (max 10Mbyte) *supports up to 4 drives *Max of 5000 records per file *max 6K record size *max of 62 fields *9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference *user defined variables *generates form letters from records. Please ask for leaflet. **£99(c)**

STARdataBASE: A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. **NEW** **£69(d)**

VIEWSTORE: An exciting, powerful database with many features: Display can be 'spreadsheet' or 'card-layout' type. Powerful selection and sorting utilities. Any screen mode can be used. Data can be sent to View and ViewSheet. Maximum file size 4096MByte!. Maximum record size 60K. **£52(c)**

CP/M SOFTWARE FOR TORCH Z80 ACORN Z80 PROCESSOR

We can now supply almost any CP/M based software package in a format suitable for the Torch Z80 and Acorn Z80 second processors. The following are generally available from stock.

DBASE II £335(a) WORDSTAR PROFESSIONAL £380(a)
WORDSTAR £275(a) DBASE II Tutorial..... £32(c)
PROPASCAL £220(a) Supercalc 2 £200(c)

Phone for your specific requirements.
Please specify the type of format (TORCH or ACORN) required.

CP/M SOFTWARE FOR ACORN & TORCH Z80

WORDSTAR PROFESSIONAL: The advanced word processing package comprising of WordStar, MailMerge, StarIndex and SpellStar, a total combination offering substantial savings on individual prices. WordStar is the best selling word processing program on the market. Extensive operator aids include a comprehensive yet friendly manual, step-by-step training guide, command cards, on-screen menus with four levels of help messages etc. etc. SpellStar checks text files against its 20,000 word-plus dictionary. You can both add to the dictionary and create specific supplementary ones. Mailmerge is ideal for mailing applications where lists are selected on a range of criteria. It enables the fast production of personalised form letters, mailing labels, invoices, etc. StarIndex creates alphabetical indexes, tables of contents, paragraph numbering and much more.

WORDSTAR PROFESSIONAL £310(a)
WORDSTAR £275(a) MAILMERGE £145(a)

DBase-II: Undoubtedly 'The Database', can be used for an almost limitless number of business applications, ranging from mailing list preparation and maintenance through to running accounting ledgers and payrolls. In addition to standard database features it provides much more. An on-disc tutorial takes you from setting up a simple file all the way through to setting up custom screens and reports. Automatic calculations may be performed on data, and fields or entire databases may be modified or replaced with single, English-like basic commands; Dbase-II can therefore be used by general personnel having no programming knowledge. It can be tailored to suit a variety of professions and individual needs, with files such as accounting, payroll, time billing, job costing, scheduling and mailing lists. It can access several files at a time. It is fast, flexible and powerful. **£335(a)**

SuperCalc-2: A powerful easily operated financial planning tool. Using a grid of 63 columns by 254 rows each cell can hold up to 127 characters. Many facilities include, split screen, powerful editing, data protection, consolidation, sorting, calendar clock etc. etc. **£200(c)**

PRO-PASCAL: A complete implementation of the International Standard for Pascal, it has been validated by BSI. Compiles translated source code programs into machine code, which is executed directly by the processor, rather than being interpreted. The package includes a compiler, library, link editor, library manager, and cross referencing utility. **£220(a)**

BSTAM: A telecommunication facility used for transmitting any size CP/M file. **£165(b)**

Other packages available include CIS-COBOL, INFOSTAR, FRIDAY, DMS +, FMS, SAGE, ATI TUTORIALS, MACRO-80 etc. Please telephone with your requirements.

TORCH GRADUATE SOFTWARE

We are able to supply most popular software packages including: FRAMEWORK, WORDSTAR, WORD, EASY-WRITER, DBase-II & III, LOTUS-123, VISICALC, SAGE etc. Please telephone with your requirements.

ROMs/SOFTWARE

VIEW Acorn's new version V2.1 word processor rom. Advantages include printing straight from memory and editing in any mode. **£48(c)**

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. **£52(c)**

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. **£13(d)**

17 Burnley Road, London NW10 1ED
Telephone: 01-208 1177. Telex: 922800

WORDWISE: One of the most popular word processors for general use £34(d). Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price £16.50(d). If bought with Wordwise: No p&p and only £14.

WORDWISE PLUS: The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. New facilities include: 2nd Processor compatible allowing 80 column previewing in all cases, a new Basic-like language, new editing features and embedded commands etc etc. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. A new 56 page introductory manual and a 180 page reference manual complete this rather special package. Finally, it is able to use existing Wordwise files without any modification. £49(d)

SPELLCHECK II: A ROM based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17,000 words on 100K drive. Fully compatible with 6502 second processor. £26(d)

ISO-PASCAL: Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60(c)

OXFORD PASCAL: A fast, compact P-Code compiler, that fully utilises BBC Graphics and sound, contains a powerful editor, and produces 'stand-alone' software. £43(c)

ACORN LOGO: A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £60(b)

ULTRACALC 2: This enhanced version of the original BBC Publications popular spreadsheet ROM includes many new features including full compatability with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spread-sheets. £69(d)

INTERSHEET: The new spreadsheet from Computer Concepts. Many advanced facilities including 105 character display, several spreadsheets may be used at once, may be used with View & Wordwise etc. etc. £49(c)

VIEWSHEET: Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be re-arranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £52(d)

BCPL: A full implementation of the BCPL compiler language consisting of the language ROM, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. BCPL can be used to develop games programs, commercial packages, system software, to write control systems and to produce programs which otherwise would need to be written in assembler. £52(b)

BCPL STAND ALONE GENERATOR: Utilities in this package enable the programs developed using the BCPL ROM to be converted so that they can be run on any BBC micro whether it has a BCPL ROM or not. Stand alone programs for other 6502 based systems can also be developed. £43(d)

BCPL CALCULATIONS PACKAGE: Supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. £17.30(b)

ACORN LISP Rom £43(d); FORTH £43(d); COMAL £43(d)

COMPUTER CONCEPTS COMPILER: Please phone for availability.

G:FORTH: An advanced implementation of FORTH which follows the 79-Standard specification on a 16K ROM and has a full double number extension set. It incorporates an editor, 6502 assembler, very fast turtle graphics and supports extensive string and file handling. It contains 540 predefined words including those for reading joystick ports, produce sounds, set and read the time and produce random numbers. Fully compatible with disc or tape filing systems and works in any mode. Package comes complete with a USER GUIDE, Introduction to FORTH and 16K GFORTH ROM. £43(d)

DISC DOCTOR: Computer Concept's popular disc utility ROM which adds 20 commands to the DFS system. £27(d)

DISCMASTER: Disc Utility. £16(d)

EXMON-II: Advanced M/C Monitor. £24(d)

TOOLKIT: Adds 27 new commands to BBC Basic. £23(d)

SLEUTH: Basic Debugger. £24(d)

GRAPHICS ROM "*" £27(d)

PRINTMASTER: The ROM that features the most versatile screen dumps for the Epson MX/RX/FX80 and KAGA PRINTERS. Includes mode 7, magnification, character definition, enlarged text, etc. etc — in short — this ROM does it all! £28(d)

DUMPMASTER: Disc based dumps for many printers. £10(d)

MUROM: Music Development ROM. £24(d)

BILLBOARD: A useful program that enables your BBC to produce super-large 'Billboard' type characters i.e. a continuous horizontal scrolling of super-large characters. Supplied in ROM. £16.50(d)

HELP: ROM based comprehensive on screen HELP facility to aid and speed up programming. £21(d)

MICROGUIDE: Keyboard Key-Plate. £16.50(d)

MICROTEXT: The authoring system from the National Physical Laboratory. Disc £53(b) Cassette £43(b)

REPLICA II: 40 & 80 Track Versions available. £10.35(d)

BROM: The new utility ROM from Clares — a Toolkit ROM that gives you full screen editing. Many extra functions are included. £30(d)

BEEBUG DESIGN £16.50(d)

BEEBUG SUPERPLOT Cass £8.50(d)

SPELLCHECK-I £16.50(d)

MASTERFILE II: The new version of the popular general purpose file management system. It allows large amounts of information to be stored and processed. It is extremely powerful yet flexible to use. The disc version allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. Typically, using 5 fields, about 2000 records may be stored on a 100K disc. This latest version features many new facilities including use with WORDWISE/VIEW £16.50(d) Disc (80 or 40T).

HERSEY CHARACTER: Font generator £12.50(d)

When ordering software on disc please specify track format (40/80)

BOOKS

(No VAT p&p £1.50 per book)

CPU/Assembly Language Books

6502 Applications £12.50
6502 Assy Lang Prog £17.50
6502 M/C for Beginners £ 5.95
6502 Advanced Programming £11.95
6502 Programming £13.95
6800 Prog Reference Manual £ 9.00
6809 Assy Lang Programming £13.45
6809 Programming £12.95
8086 Book £19.50
Prog. the 8086/89 £13.50
68000 Assy Lang Prog £18.95

LANGUAGES

BBC Micro Sideways Roms Rays £ 9.95
CP/M Handbook £13.95
Mastering the CP/M £16.50
FORTRAN Cookbook £ 8.00
Introduction to PASCAL £16.50
Prog the Micro with PASCAL £ 8.50
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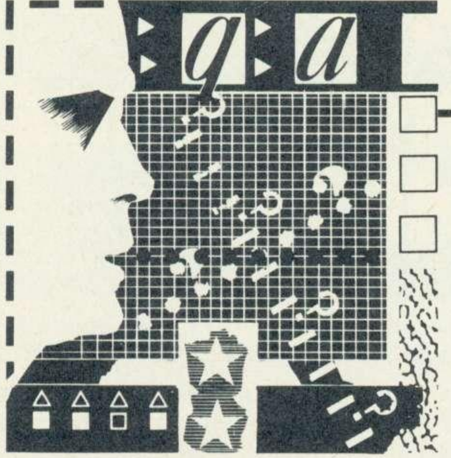
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Martin Phillips unravels the mysteries of ASCII codes, and passes on your tips, including how to find the current filing system in use

Elegant filing system routine

SEVERAL readers have written to point out that there is a simpler way of writing the procedure to determine the current filing system in use than that published in February's Hints and Tips.

Paul Holgate from Nottingham has produced the most elegant variations of this function. Rather than using a short machine-code routine to find the current value of the filing system code number, Paul has used the USR statement. The first function only returns the current filing system value:

```
30000 DEF FNfilesystem
30010 LOCAL A%,Y%
30020 =USR(&FFDA) AND &F
```

By making A% and Y% local, both are initialised to 0.

The second function returns the current filing system as a string:

```
30000 DEF FNfilesystem
30010 LOCAL A%,Y%,I%,F$:
   RESTORE 30040
30020 FOR I%=0 TO USR(&FFDA)
   AND &F:READ F$:NEXT I%
30030 =F$
30040 DATA None, Tape-1200,
   Tape-300,ROM,Disc,Net, Teletext
```

Database update

TONY Dixon has found a problem with the simple database presented in February and March's Hints and Tips. He lost his data when he just pressed Return at line 1580 of version 7. The program crashed with a subscript error. Tony suggests the following additional line should be inserted to trap this:

```
1585 IF A>F% OR A<1 THEN
   GOTO 1580
```

There are two points to note here. The first is always to save your data as soon as it has been entered. Indeed, it is better to save the data after so many entries, and then carry on adding more. That way, most of your data is 'protected' against any eventuality. This could be a bug in the program itself, a typing error, or even a power cut (– the dog tripping over the mains lead?).

The second point is that the database was not presented as a foolproof polished program. It was presented to show some of the methods that can be used to create a database, and as such, attention to screen display, error trapping and versatility would have obscured the programming techniques used. There are several areas where the program could crash given a particular set of circumstances. Readers are encouraged to find such areas for improvement and perhaps tailor the database for their own needs.

The byte before last

D L HARPER from Nottingham has written in to correct a mistake in February's Hints and Tips, concerning the use of *SAVE to save a screen memory area.

The *SAVE command is followed by at least two parameters – the first of these is the first byte to be saved. The second is not the last byte to be saved as was indicated in the article; it should be the byte after the last one to be saved. Therefore to save a mode 2 screen, for example, you should use:

```
*SAVE "screen" 3000 8000
```

and for a mode 4 or 5 screen:

```
*SAVE "screen" 5800 8000
```

Getting the number of ASCII codes

MOST readers will have heard of ASCII (American Standard Code for Information Interchange) codes – they are frequently mentioned in the User Guide, books and articles. They can be confusing to understand, and are not as standard as their name suggests.

In simple terms, the computer stores everything in memory as numbers. Each of the memory locations in the computer can hold a number in the range 0-255, stored as an 8-bit binary number. (Integer and real numbers cannot be stored in just one location, and have to be stored in an adjacent group of locations, four for an integer, and five for a real number.)

To store actual letters or symbols the computer uses a code; it stores them in memory as a number in the range 32 to 127. Each letter or symbol is given a unique code from the ASCII system.

When, for example, a computer sends information to a printer, it cannot transmit an actual letter, so it has to send the letter coded as a number. The number is transmitted in binary and, in the case of a parallel input printer, requires seven lines of information to be sent at once. Inside the printer the ASCII code is then printed out as the appropriate letter or symbol. Listing 1 shows a simple demonstration of how the transmission of the number in binary is achieved. When run, the seven lines are shown in yellow, and after the message to be transmitted has been entered, each letter is coded, and transmitted down the lines as a series of red blocks to simulate the digital signal. Below the seven lines, the character being transmitted is also shown. The 'transmission speed' of the program can be changed by altering the delay time set in line 400. Reducing the INKEY parameter will speed up the display, increasing it will slow down the speed.

The ASCII codes for all the printable characters are shown in figure 1.

The following line will print out the character A.

```
PRINT CHR$(65)
```

Another way this could be written is:

```
VDU 65
```

It's possible to display the ASCII codes on the screen. Listing 2 is a very simple program do this, but it does not allow all the codes to be shown at once. Indeed the codes will be printed on the screen as it scrolls so it's only possible to read them by preventing the screen scrolling, using Shift-CTRL. This can be overcome by putting the computer into page

32 ..	33 .. !	34 .. "	35 .. #	36 .. $	37 .. %
38 .. &	39 .. '	40 .. (	41 ..)	42 .. *	43 .. +
44 .. ,	45 .. −	46 .. .	47 .. /	48 .. 0	49 .. 1
50 .. 2	51 .. 3	52 .. 4	53 .. 5	54 .. 6	55 .. 7
56 .. 8	57 .. 9	58 .. :	59 .. ;	60 .. <	61 .. =
62 .. >	63 .. ?	64 .. @	65 .. A	66 .. B	67 .. C
68 .. D	69 .. E	70 .. F	71 .. G	72 .. H	73 .. I
74 .. J	75 .. K	76 .. L	77 .. M	78 .. N	79 .. O
80 .. P	81 .. Q	82 .. R	83 .. S	84 .. T	85 .. U
86 .. V	87 .. W	88 .. X	89 .. Y	90 .. Z	91 .. [
92 .. \	93 ..]	94 .. ^	95 .. _	96 .. '	97 .. a
98 .. b	99 .. c	100 .. d	101 .. e	102 .. f	103 .. g
104 .. h	105 .. i	106 .. j	107 .. k	108 .. l	109 .. m
110 .. n	111 .. o	112 .. p	113 .. q	114 .. r	115 .. s
116 .. t	117 .. u	118 .. v	119 .. w	120 .. x	121 .. y
122 .. z	123 .. {	124 .. ¦	125 .. }	126 .. ~	

Figure 1. ASCII codes for printable characters

mode before running the program using CTRL-N, and then pressing Shift to see the next screen while the program is running.

Listing 3 is slightly more complicated and will display all the codes on the screen at once by using four columns. It can be seen that these codes match the keys on the BBC micro keyboard. However, some different symbols can be produced. When the BBC computer is switched on the screen display gives teletext characters. These correspond fairly closely to the 'standard' ASCII codes but there are some differences. Listing 4 works in the teletext mode (mode 7) and shows these differences, also shown in figure 2.

From the list of codes in figure 1 it would appear that codes 0-31 are not used – they are, but do not print characters. Within the BBC micro itself (or Electron), these ASCII codes are the VDU codes. Some of these correspond to the standard ASCII codes, eg, ASCII code 13 is the carriage return code. This same code is entered into the computer when the Return key is pressed. An understanding of these particular codes is useful if one wishes to make fullest use of a printer.

One rather odd ASCII code is the last one, number 127. This is called backspace and delete, and is generated when the Delete key is pressed. It deletes the previous character and moves the cursor back one space.

The best way to get a 'feel' for ASCII codes is to use them. Listing 5 shows a simple routine to input numbers only. Line 160 tests that only a character in the range 0-9 has been entered, and other keypresses (apart from Return, code 13) are ignored. Although a rather pointless routine in itself, it could be used in menu selection programs to trap incorrect keypresses. By altering line 160, it is possible to test for any range of ASCII codes.

Listing 6 shows a more useful application. It's a routine to input names, and its special feature is that it will ignore the state of the Caps Lock or Shift key and put in its own capital or lower-case letters as appropriate.

Most of the listing is straightforward. Each letter is entered using the GET statement. The ASCII code of the key pressed is stored in the variable A. Any upper-case letter is first changed to lower-case at line 160. Line 170 then checks to see if a letter has been entered. If a letter is detected, then a check is made to see whether a capital letter is needed (FNtest), and if so 32 is added to the ASCII value for that letter.

This might seem rather long-winded, first to change the letter to lower-case and then change it back again, but it is not as cumbersome as it first appears. Line 180 checks for a space (ASCII value 32) or a hyphen (ASCII value 45), as a capital letter could also follow these. Line 180 provides a measure of idiot-proofing by first checking that the previous symbol is not also a hyphen or a space. Although not really necessary, this was very simple to implement. Lastly, a check has to be made to see if the Delete key has been pressed (line 190). If it has, and some letters have already been entered, then the last letter is deleted both in the string containing the name (name$) and on the screen. The procedure is terminated when Return (ASCII code 13) is detected at line 200. It ignores any other ASCII character entered apart from the 26 letters of the alphabet, space, hyphen, Delete or Return.

PROCadd is a short procedure to add the character onto the string in which the name is being stored, name$. This procedure also prints the letter on the screen, as the GET statement does not print it. As we shall see later, this can prove to be quite an advantage.

FNtest is the routine to test whether a capital letter is needed. It will be true if it is the first letter of the name, or follows a hyphen, or follows a space. This then caters for the vast majority of names. It could be extended to deal with other instances where a capital letter should be added, but it can never be totally foolproof. How could it possibly be made to work correctly for both MacDonald and Macdonald?

By a very simple extension, this procedure could be made to work in double-height print in mode 7. (Electron owners could adapt this to work in mode 4 by using the double-height routine printed in a previous Hints and Tips.) This relies on the fact that unlike the INPUT statement, the GET statement does not print the character on the screen. In order to get a character printed on the screen in teletext mode, it needs to be printed twice on successive lines, following the double-height teletext code (141). This cannot be achieved using the INPUT statement. Two new procedures have been added to listing 6 to allow a double-height routine (listing 7). PROCprint is the procedure to print each character twice.

Some of the ASCII control characters are also used. Code 8 moves the cursor back one character, ASCII value 11 moves the cursor up one line, and 10 moves it down. The delete function does not work correctly without a similar system of moving the cursor to the correct place, so a procedure has to be included to achieve this – it uses code 9 to move the cursor forward one space.

Another way that the ASCII codes can be manipulated is in the creation of secret messages. The simplest sort of message to generate is to take a letter and move it a fixed amount along in the

	Mode 7 character	Other modes
ASCII code 91	←	[
ASCII code 92	½	\
ASCII code 93	→	]
ASCII code 94	↑	^
ASCII code 123	¼	{
ASCII code 124	∥	¦
ASCII code 125	¾	}
ASCII code 126	÷	~

Figure 2. Differences between ASCII codes for mode 7 and other modes

alphabet, with 'wraparound' to the start again if necessary. It can then be decoded by a similar movement backwards. Listing 8 shows such a program. This sort of encoding is not too difficult to crack, as it is easy to look for the occurrence of the common letters.

A secret message can be made almost impossible to crack by using the random number generator in BBC Basic. If a random number is added to each character, including punctuation and spaces, then no pattern for the letters or spaces can be determined. It's possible to 'seed' the random number generator so that it starts off at the same sequence each time, thus making it possible to decode the message provided the seed number is known. The 'seed' number can be in the range −2147483648 to 2147483647, so it would be a very lucky person who found the correct 'seed' number by trial and error! Most people, however, tend to use a very simple sequence of numbers, which would make such a code easier to crack.

To illustrate how this 'seeding' works, try the following short program to print out ten random numbers:

```
20 FOR N=1 TO 10
30 PRINT RND (100)
40 NEXT N
```

Run it a few times, to show that each time a different sequence of numbers is generated. Now add the following line:

```
10 X=RND (−100)
```

This 'seeds' the random number generator, and now the program will give the same sequence each time it is run. Change the 'seed' value at line 10 to get a different sequence of ten numbers.

Listing 9 shows the secret message creator and decoder. It takes any character or symbol and adds a random number on to it. It uses the MOD statement to keep the ASCII code in the range 32-126. To decode the message, the same random number is subtracted from the ASCII code. To prevent the code going negative, 95 is first added to it. This has no effect on the encoding stage as it is 'filtered out' by the MOD statement. If one is still not satisfied that one's code is secure enough, then the encoding process could be repeated on the already encoded message as often as one wishes, using the same or different 'seeds'. The copy keys can be used to copy the previously encoded message to save the need for retyping. Listing 9 provides very little by way of screen presentation. This could be greatly improved, and a printout option could be included.

The ASCII code demonstration listings 1 to 9 are on yellow pages 97–99

ASCII code	Abbreviation	Meaning
0	NUL	null
1	SOX	start of heading
2	STX	start of text
3	ETX	end of text
4	EOT	end of transmission
5	ENQ	enquiry
6	ACK	acknowledge
7*	BEL	bell
8*	BS	backspace
9*	HT	horizontal tabulation
10*	LF	line feed
11*	VT	vertical tabulation
12*	FF	form feed
13*	CR	carriage return
14	SO	shift out
15	SI	shift in
16	DLE	data link escape
17	DC1	device control 1
18	DC2	device control 2
19	DC3	device control 3
20	DC4	device control 4
21	NAK	negative acknowledge
22	SYN	synchronous idle
23	ETB	end of transmission block
24	CAN	cancel
25	EM	end of medium
26	SUB	substitute
27*	ESC	escape
28	FS	file separator
29	GS	group separator
30	RS	record separator
31	US	unit separator

Figure 3. Abbreviation of ASCII codes

When using printers, one needs a clear understanding of the ASCII codes, and in particular codes 0-31, the control codes. Printer manuals are not written with any particular type of computer in mind, and therefore the instructions need to be adapted to suit the BBC micro. As most printer manuals are not well written in the first place, this is quite a difficult task. Another problem is that the ASCII control codes are usually referred to not by their numbers, but by abbreviations (figure 3) which mean little to the average computer user.

The codes followed by an asterisk are equivalent to the BBC micro's VDU control codes of the same number. Therefore, when the printer handbook states that emphasised printing can be enabled by using the 'ESC E' code, this can be 'translated' to be 27 (the ASCII code for ESC) followed by 69 (the ASCII code for the capital letter 'E'). This can be sent to the printer either using the PRINT CHR$ . . . format or the VDU format. The latter is the easier:

```
VDU 2,1,27,1,69
```

The 2 is the VDU code to enable the printer, the 1 is the VDU code to send the next byte to the printer only. For some printers you must include this, on others it's not necessary. Trial and error is the only way of finding out. Another example is 'SO' to set the enlarged mode (on a dot-matrix printer). 'SO' has an ASCII value of 14, therefore the VDU statement would be:

```
VDU 2,1,14
```

By using these codes, several effects can be implemented on a printer. For example, a problem posed by D A Higgs of Reddich (which wins him £5 for raising a simple but very interesting point), is to write the word 'Hotel' with an accent above the 'o' – a feature not availabe on most printers.

It can be done by using the '^' symbol and the backspace. Print 'Ho', print ASCII code 8, and then print '^tel'. This will give the word 'Hôtel' with the accent correctly positioned above the 'o'. If you are using a wordprocessor such as *Wordwise* then all that's necessary is to insert the embedded command 'OC8' between the 'o' and the '^'. This same technique can be used on a printer that does not print a zero with a diagonal line through it. First print the '0', then backspace followed by a '/'. A more elaborate example could involve the use of superscripts and subscripts to present an equation.

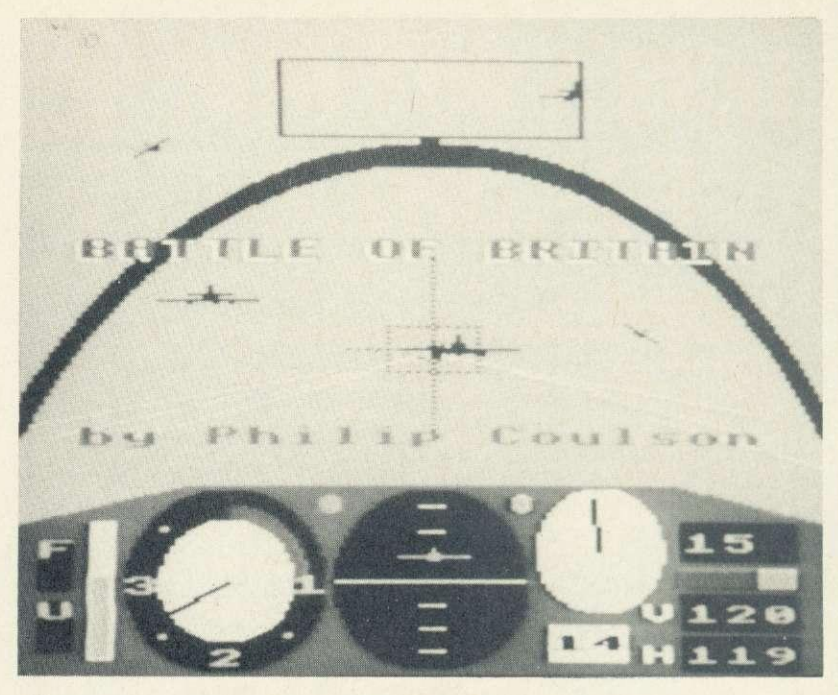
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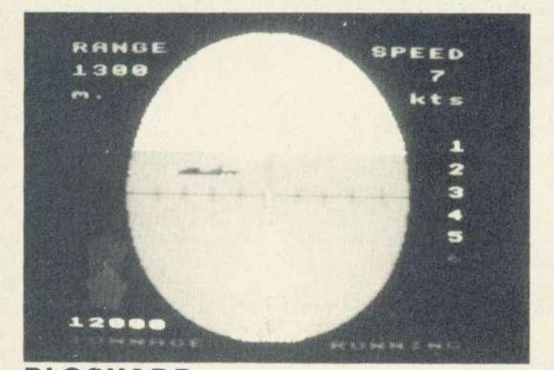
Watch out! Your mirror tells you there's an Me109 on your tail. You see the flashes and hear the chatter of his guns. You dive steeply away, and manage to shake him off. A Hurricane fills your sights and you almost open fire on him. That could have cost you a lot of points! Planes zoom towards you and climb and dive around you as you seek out your next target. A slow-moving Stuka falls easy prey to your guns and with your low ammo warning light flashing, you carefully aim your last few rounds at a fleeing Junkers 88.

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PAINLESS WAYS TO TRAP THOSE BUGS

Do you make mistakes entering listings? Track them down with these short programs from Tessie Revivis

BASIC can cause many problems when it comes to typing in programs from magazine listings or, when you're feeling bold, writing your own programs – which is what it's all about after all.

However, it can also hold the answers to these problems. How? Simple. You incorporate a few small utility-type procedures that you can call from various points within the program in an effort to identify the dreaded bug that's creating all your misery.

Trying to identify the most problematic areas of program entry is in itself a problem. The first thing to do is to locate just what the error is and where it occurs.

Obvious, but not always easy, as this only applies if the error is able to be trapped, ie, one that will stop the computer from functioning. An example of a trapable error is the 'Syntax error'. In this instance you will have probably typed in a command correctly apart from the odd letter, or you may have transposed two letters.

The following program will give a syntax error:

```
10 PRINT"This is a Syntax error"
20 MODS 6
```

What should be typed is MODE, but the S key has been hit instead of the E key – understandable as they are adjacent. This error can be difficult to spot if you use long, complex multi-statement lines. An error of syntax in a single command line is much easier to spot than one in a program line that might be 255 characters long.

Keep program lines short and sweet – if you need to use a multi-statement line longer than around 40 characters or so then you should replace it with a PROCedure.

Procedures

All programs should include a PROC that will give all the details you need to establish where a trapable error is occuring – listing 1 is a typical example. PROCerror is numbered from 900 onwards – the high line numbers are used for a reason I'll tell you about later. Line 900 contains the descriptive REM followed by the entry into the procedure itself. Line 920 gives a bleep on the speaker, hoping to catch your attention. Line 930 uses REPORT to print the error message and the line number where the error occurred – its error code number is also displayed. To allow this procedure to be used, we need to point the micro in its general direction, and this is facilitated with the ON ERROR command.

This should be entered as early in a program as possible, ie:

```
10 ON ERROR PROCerror:END
```

Once the computer encounters it, a mental note is made of its presence. Should an error occur, the micro seeks it out once again and then calls the PROC specified after it.

Try for yourself – add the following three lines to the program:

```
10ON ERROR PROCerror:END
20MODS 6
30END
```

Here a syntax error has been incorporated into line 20 – the same error as the one described above.

Now run the program and see for yourself what happens – everything you wanted to know about errors but were afraid to ask!

Logical errors

The worst errors are the logical ones, the ones that occur when the program runs OK but doesn't do what it's supposed to. Almost certainly the fault is held within a variable somewhere, but where?

The solution will vary depending on the nature of the problem, and listings 2 to 5 (you'll find them on yellow pages 99 and 100) should be of use. Again they're all PROCs and use different high line numbers.

When running a program that uses the 'resident' integer variables A% to Z%, remember that they are not reset each time you run it. Being resident they keep their last assigned values, so failing to set a resident variable at the start of a program can be a real problem. For example, enter directly at the

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keyboard:

```
Z%=23
```

Now enter

```
10 FOR N=1 TO 100
20 Z%=Z%+1
30 NEXT N
40 PRINT Z%
```

Run this and the result printed is 123, not 100 as you might have expected. Re-running the program will bump the value of Z% up to 223 and so on. The moral is always to set the residents to zero before running a program.

The procedure PROCclear in listing 2 will perform this task for you automatically, clearing A% through to Z% to 0. It does not go through each variable individually, ie:

```
A%=0
B%=0
C%=0
```

and so on. Instead it pokes the memory used by your micro to hold the contents of these variables directly.

After entering listing 2 add the following lines to test it out:

```
10 A%=123456
20 Z%=123456
30 PROCclear
40 PRINT "A%=";A%;"Z%=";Z%
50 END
```

Line 30 instigates the integer clear, and can be called from within programs at any point you require them to be zeroed.

Listing 3 is similar, but this time it sets the resident variables to a non-zero value, −1 in this case: useful if you wish to test if a certain variable reaches zero. These two programs are most effective when used in conjunction with another procedure that will print the values of the resident variables – listing 4 supplies this one.

Once entered, add the following lines to try it out:

```
10 FOR var%=&404 TO &46C STEP 4
20 !var%=RND(1000)
30 NEXT var%
40 PROCIvar
50 END
```

Lines 10 to 30 store a random number under 1000 in each of the resident variables. Line 40 then calls the procedure that prints the assigned values onto the screen.

I find this procedure particularly useful when it comes to trapping errors within loops – the proviso here, of course, is that you use the residents to hold the values you want to manipulate. This is not always practical, particularly when you're keen on using more meaningful variable names. However, each variable could be replaced in turn by a master resident integer as you work your way through them, replacing the former variable name once you've assured yourself that the one in question is not the culprit.

Delete lines 10 to 50 and type in the following to see how you can watch variables being altered during the course of a FOR. . .NEXT loop:

```
10 A%=200:B%=0:C%=100:
   D%=300
20 FOR N%=1 TO 20
30 PROCIvar
40 A%=A%-20
50 B%=B%+2
60 C%=C%*2
70 D%=D%-2
80 NEXT
90 END
```

Another area where mistakes can be made is when you accidentally use the same variable name twice. This is quite easy to do even when you're copying a magazine listing. For example, the program:

```
10 var=100
20 REM more program here
30 var=200
40 REM rest of program
```

contains the variable 'var' assigned twice. You might expect its value to be 100, but line 30 resets it – you typed in line 30 incorrectly and perhaps 'var' should have been 'bal'.

Listing 5 will provide a list of all the non-resident variables you have used in a program, thus allowing you to see if one is mysteriously missing. You will need to check this against the variable list in the magazine or your own notes (always keep a list of the variables you are using).

This listing is also the first assembly program we have encountered in First Byte, and this is a prelude to the 'ultimate' checking aid to be presented in next month's issue. Although we are dealing with machine code in listing 5, you don't need to be able to program assembler to enter an assembly listing. Just treat it as a normal program. In fact, if you make a mistake you will be told so by the program, so just recheck.

Once you've entered the listing, you can test it by adding the following two lines:

```
10 PROCvars
20 END
```

Run the program, and a list of the variables used in the current program will be displayed.

Add a few more if you like, just to confirm that it's not being biased towards its own variables:

```
5 test=1234:silly=9876:billy=180
```

When using this in a bigger program it might be useful to add the following:

```
2095PRINT''Press a key to
     continue'':A=GET
```

just to halt the program temporarily while you examine the list.

As I said earlier, each of the procedures presented has been given unique line numbers. This is to enable you to tack them onto the end of your own programs.

To do this, after entering and testing each procedure, delete the 'extra' testing lines given above, and then save the procedure by spooling it to tape or disc. For example, to save listing 1, proceed as follows:

```
*SPOOL PERROR
LIST
*SPOOL
```

*SPOOL PERROR will create a file called PERROR (that's our reminder P(roc)ERROR). By listing the program you send the program to the tape or disc as though it was a series of keyboard characters. The final *SPOOL closes the file. Do the same for the other programs.

Now each time you write a program you wish to debug or use with the above programs, you can load the spooled programs in as though they had been typed in at the keyboard and without affecting any program in memory – providing you have not used any clashing line numbers, in which case the spooled program will overwrite them.

Type NEW and then enter:

```
10 REM TESTING A SPOOL FILE
20 REM LOAD IN WITH *EXEC
30 ON ERROR PROCerror
40 THIS IS THE ERROR!
50 END
```

Now load PERROR in with:

```
*EXEC PERROR
```

When the program is found on the disc or tape it will load in just as though each line had been typed in at the keyboard! Run the program to test it.

Try *EXECing the other program files to see just how easy it is to add frequently-used program listings – in this way you can build up your own procedure library.

Next month I'll describe a program that will allow you to produce checksums of individual program lines. Compare these with the ones to be presented in *Acorn User* to help you spot the bug!

You'll find Tessie Revivis' bug-trapping listings on yellow pages 99 and 100

Write to: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2H 7ED

Let Logo grow naturally

Sir, I enjoyed Joe Telford's review of the BBC Logos in the May issue which was thorough and fair, as one would expect. I am writing to comment on his remarks concerning a Logo standard. Logotron markets its Logo as an LCSI standard version, and Joe rightly comments on the differences.

In the first place, I do not think the time is ripe to establish a standard set of primitives. As personal computers grow in power and memory capacity, it will be increasingly possible to provide larger sets of primitives. The language has evolved in many ways in several different centres (notably MIT and Edinburgh University) since its appearance almost 20 years ago.

We actually believe that our elimination of PONS, POTS, etc, is an advance. We have also made it possible to edit or save a single variable. It remains to be seen whether other developers will follow us, but there is no copyright on such ideas. I really do believe in the English approach to language development, by evolution, rather than the continental approach with their national academies of old fuddy-duddies, who decide whether a word really is a word or not. Let usage decide.

I am more interested in some other syntactic standards. It seems that IF predicate <instructionalist1> <instructionalist2> is winning out over IF predicate THEN . . . ELSE . . . Acornsoft Logo has, in general, followed the LCSI/MIT tradition rather than the Edinburgh or MIT/Terrapin traditions. Open University and LSL have both launched innovations of their own, the latter clearly influenced by Edinburgh. I think the prefix/infix issue is still open, and it would be good to see more interest in this question from all parties.

Logotron Logo offers both infix and prefix notation, but I would be much happier if Logo could standardise on prefix only. It is an issue which confuses much of the discussion about benchmarks. A prefix-only version has a built-in advantage as the parser does not have to check backwards and forwards every time it meets an operator.

I fear that if a standard were established today, it would freeze development of the language on the basis of the MIT/LCSI standard simply by majority vote. Look what has happened to Lisp, which is still stuck with all the CAR, CDR, CONS, LAMBDA nonsense. We must fight against the QWERTY Phenomenon in Logo, even if it is inconvenient to reviewers writing comparative reviews. Seymour Papert said at last year's British Logo User Group conference that we should be completely rethinking Logo, and certainly this is a trend within the Logo community.

We are looking at its shortcomings, discussing them with users of other languages (eg, APL), and wondering where to go next. Rather than a language standard, Logo should be an attitude of mind, an open-ended and exploratory approach to computing, with a history, culture, literature, and some interesting but still experimental implementations of the programming language of the future.

Christopher Roper
Tecmedia Ltd
Loughborough

Joe Telford replies: The standardisation problem will always arise with every language. My comment is simply that current Logos should have major features standardised. If the language is still evolving, then the evolution needs direction to the real needs of users (see my article in April issue).

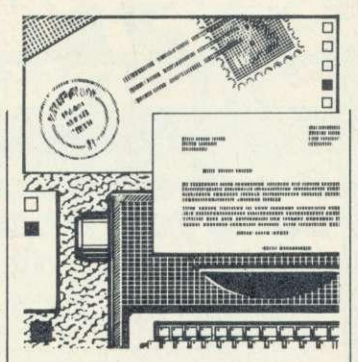
Unlike Chris, I prefer infix notation, because that is how I think. I suspect that calculators in schools will force this feature on all Logos.

I particularly support Chris's comments on the Logo culture, but I wonder whether we are there yet. I even wonder (shame!) whether Logo can evolve from its current implementations to be a more valuable language still. I reckon that 1985 Logos are about as sophisticated as the Basics of the early 1970s, in terms of meeting the needs ot other than graphic manipulation.

Opportunities of Open Logo

Sir, In his Logo review of May, Joe Telford concludes by suggesting that schools go for either the Acornsoft or Logotron version on the grounds of cost. This is unfortunate to say the least for it overlooks the 'alternative' method for schools to acquire Open Logo.

As implied by Joe's article, Open Logo was developed for academic rather than commercial reasons. In particular, although it is published by BBC Publications as a stand-alone package, the full Open Logo implementation is also included in two in-service training packs published by the Open University's Micros in Schools Project. The packs 'Educational Software' and 'Micros in Action in the Classroom', offer full training in software design appreciation and the practical aspects of using the micro, for only £79 per pack, with appropriate bulk-purchase discounts of up to a fifth. As the pack price includes not only Open Logo but also further software, case studies and other written materials, and both audio and video components, I would contend that the appropriate Open University pack would be the best buy for schools



wishing to aquire Logo.

Further information on Micros in Schools packs can be obtained from the project manager at The Open University, Institute of Educational Technology, Walton Hall, Milton Keynes MK7 6AA.

Charles Stannett
Lecturer in Educational Software
The Open University

Joe Telford replies: Unfortunately, the adage that everyone in Cleverland has crystal balls is wrong, thus I was unable to include this revelation in the review of Logo. I did mention that I looked forward to possible teaching materials, but at no time were such materials offered for re-

page 51 ▶

Further developments on the board

Sir, I read Robert Southall's article (*Acorn User*, January) on Susan Kingbury's activity board (featured in the August 1984 issue) with great interest, and would like to tell you how her idea was developed for this school by Michael Evans. He has produced a useful disc-based system of programs which allows the children to create their own sentences and correct them if necessary.

The *Main* program runs in exactly the same way as Susan Kingsbury's; there are also programs called *Loader* and *Edit* and all these are put together on a menu.

Loader allows the children to type in their own story of one to four lines at each station. The sentences appear on the screen exactly as they will appear in the *Main* program. There is a page for the title which can fill one line (when the children save their file they need to be told that the file name can only be seven letters long), a page for each station and clear instructions. At the end of the journey round the activity board, the story can be printed on the screen in mode 7 by pressing P.

The third part of the program, *Edit*, allows the children or their teacher to make corrections. The children are given an overlay with the eight stations marked on it and they can design their own route and create their own story.

There are many ways that these programs could be used; for example, if the children are very young they can design the route and then dictate their story to an adult who will type it in or the teacher can create a series of files that can be called up, like Robert Southall's stories.

If you would like these programs, send a 40-track disc, 50p plus a SAE to myself.

Susan Kingsbury's article was an interesting and useful contribution, as it is important for children to see and use as many of the facilities on the computer as possible.

Mrs J L A Evans
(Headmistress)
Hunters Bar First School
Sharrow Vale Road
Sheffield S11 8ZG

PS: Does anyone know how to deal with double height characters in mode 7 and printers?

Printmaster from Computer Concepts should help with your problems.

view, or even mentioned as being available. Perhaps you would forward the packs for a future review of training materials for Logo.

View 2.1's American graffiti

Sir, I have been successfully using the *View* 1.4 wordprocessor for well over a year with the Aries B20 video RAM board.

I use a dual/double disc drive, with various printer drivers and printing formats on drive 1. With the text disc on drive 0, I have been using the following EXEC file to BOOT in.

```
*WORD
MODE 3
*DR.1
PRINTER (of choice)
*DR.0
*
```

I recently decided to 'upgrade' to the newer 2.1 version, and found, much to my annoyance, that I appeared to have a faulty ROM; when the cursor approached the bottom of the screen, the screen refused to scroll on using the Return key or the cursor keys, the lines of text just overwriting each other. The Shift key then allowed a scroll, but garbage had been written all over the screen, and the text was useless.

Additionally, after loading in a file, the printer driver would be lost, the message at the top of the screen showing 'Printer default'.

Fortunately, I spoke to Acornsoft before packing the 2.1 ROM right back to where it came from. Apparently, *View* 2.1 thinks that we've got American Beebs and VDUs.

To stop losing the printer driver in the above EXEC file, insert a line before PRINTER, saying NEW. The Aries people have written a routine into their ROM which sorts it all out. Instead of the EXEC file calling *View* with *Word, it calls *View* with *XWord.

So simple, and hardly a problem when one is in the know! But why no prior information? What's the big secret?

I hope this is of help to other *View* plus Aries users, which is an otherwise powerful combination.

Brian Clarke
London

***View* 2.1 was developed to handle the Americanised BBC micro with its smaller screen display. To find out which machine (BBC or US) it's in, *View* checks the value of HIMEM. If there's more memory left than on a standard 32k BBC, it assumes it's an American machine (which uses less memory for the screen display).**

So, when you use the Aries board, *View* 2.1 sees the extra memory and plays American. But that's not the end of the tale. The new B+ uses the Aries technique, so in shadow mode, with the extra memory, it goes American with the same results. But, of course, *View* 1.4 works fine.

Look out for a new version of *View* at the Acorn User Show in July.

Wordwise Plus point

Sir, It is a pity that Graham Allan (Letters page, May) did not re-read Jacquetta Megarry's review of *Wordwise Plus* and then ask any infant teacher to explain 'cloze procedures' to him before making his sarcastic comments about her excellent little program.

I feel sure that it will become one of the most widely used programs in schools with *Wordwise Plus*. One point teachers may find helpful is that it should only be used on unformatted text, ie, without any returns, blank lines, etc.

Those teachers who prefer to have dashes for letters in cloze-type work may like to try my adaptation of the program (see below).

It may be necessary to press Escape if you get a continuous bleep after running.

Ian Gustard
Newcastle-upon-Tyne

```
REPEAT
 DOTHIS
 FIND " "
 CURSOR RIGHT
 TIMES 10
 PROC blank
 CURSOR LEFT
 UNTIL EOT
DISPLAY
END

.blank
REPEAT
 IF GCT$<> " " THEN PROC change
 CURSOR LEFT
 UNTIL GCT$ = " "
ENDPROC

.change
DELETE LEFT
TYPE "-"
ENDPROC
```

The drive for compatibility

Sir, I want to bring attention to a problem which is affecting Beeb owners increasingly as more and more add-ons are put on the market – the lack of information concerning compatibility. I have no complaints about my LVL double density interface, which, in its latest version, is second processor compatible and even runs *Elite*, but, like countless other owners of so-called non-standard DFSs (ie, not Acorn) I spend a small fortune on postage or phone bills trying to check compatibility before making a purchase.

As if it were not enough that certain excellent software is not compatible, one frequently finds that a firm simply does not know if its software is compatible or not.

There are frequent letters to magazines on this problem, and the usual answer is that those who deviate from the Acorn path (including the manufacturers) should just suffer in silence. John Collins of Acorn, in your March issue, accused certain manufacturers of failing to let Acorn know about their latest DFS versions.

There is a danger that both sides will avoid responsibility by blaming the other, and the losers will be the long-suffering consumers.

If all the companies involved want to keep the essential goodwill of their customers, they have a duty to the consumer which goes beyond merely satisfying legal requirements. So why don't they get together and exchange the information they say they are so willing to share? Perhaps *Acorn User* could promote a meeting of representatives of DFS producers?

Just to set the information ball rolling, I've devised a table of titles which do work with the LVL interface. I also use the LVL with the Aries B20 and B12 fitted without problems.

Perhaps other readers can send similar information concerning their DFSs and details of compatibility with the Aries B20 board and second processors.

Another point is if you have *Wordwise Plus* and an Aries B20 fitted, then after switching the B20 off, on entering *Wordwise Plus* you cannot return to the main menu by pressing Escape as one normally does but only by pressing Break. The safest course of action seems to be to ensure the B20 is on before entering *Wordwise Plus*.

Computer Concepts	Wordwise Plus
	Printmaster
WE	Fileplus
Beebugsoft	Sleuth
	Toolkit
	Design
Acornsoft	Graphs and charts
	Picture Maker
	Elite
Century	Gemini's Database
	Beebcalc
	Beebplot
	Starfinder
Shumwari	Compucater*

Single density mode only

John Bird
Spain

Ad accuracy

Sir, With reference to your mention in the May *Acorn User* (page 17) of our company – Viglen Computer Supplies – as having fallen foul of the Advertising Standards Authority perhaps you would be good enough to allow me to clarify the situation.

As admitted by *Acorn User*'s advertisement agency, there was a printing error and Viglen was entirely blameless in the matter of the advertisement in question.

Needless to say, we always take great care in the preparation of our advertisements and their content is scrutinised before being submitted. We have a reputation for fair and competitive dealing which we go to great lengths to uphold.

Due to price fluctuations, Viglen has been forced to pass on rises to the public. However, a price rise is rare with disc drives. The ASA has failed to point out that prices of disc drives have dropped by half in the past 18 months.

We at Viglen always advise customers to check on prices by phone or by calling in at our showroom in Hanwell.

May I also add how pleased we are with the good response to our advertising we continue to get from *Acorn User*.

V Boyd
Director
Viglen Computer Supplies


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CENTRAL PROCESSING... CENTRAL PROCESSING...

J M Bowern, Sevenoaks
If you are putting together your own disc interface and it is to fit a standard BBC micro you really need to buy the 8271 floppy disc controller. The Western Digital 1770 would be a good choice for a double-density floppy disc controller and this can be operated in both single and double-density modes. However, it will not fit directly into the existing socket on board the Beeb. You need to build a butterfly board to house it and carry out the extra decoding it would need. This is no mean task so it would probably be easier and cheaper to purchase a commercially made board. We suggest you read Vincent Fojut's DFS review in this issue.

S Thorne, Canterbury
This problem sometimes occurs with *Wordwise Plus*, resulting in the display of the WORDWISE PLUS title line and causing the machine to hang up. The only way to get out of this is to switch the machine off and then back on again. The problem is created by the protection used by the ROM-based software.

Alex Gordon, South Glamorgan
Some timing difficulties have been encountered between BBC micros and second processors. Acorn is aware of these problems, which occur only in a few instances, and presumably has remedied the situation on the B+.

Because of the large amount of technical enquiries we receive in the *Acorn User* office we are now unable to reply to individual letters. However, this feature is intended to answer as many of your queries as possible, and provide a useful information spot. Please keep your letters short and to the point.

Kevin Muno, Dingwall
I suggest you start by trying to sell your programs through the £10 add pages in *Acorn User* and perhaps local computer clubs. You might also approach some of the software houses to market them.

P Davidson, Glenrothes
The ICs needed for a disc interface upgrade are:

1C 78	8271 Floppy disc controller
ICs 79, 80	7438
ICs 81, 86	74LS393
IC 82	74LS10
ICs 83, 84	CD4013B
IC 85	CD4020B
IC 87	74LS123

I suggest you take your Beeb to your local dealer, who will test your micro and adjust it as necessary.

Henry Harrison, Bracknell
The expansion connector at the rear of the Electron can be used to interface a user port. Paul Beverley described exactly this project, utilising the 6522 VIA, in the December 1983 issue of *Acorn User*. This edition is still available – see page 96 for order form. Osfile is only partially implemented on the cassette filing system so all you will be able to do is to save and load using A=0 and A=&FF respectively.



Beeb and the 6502: sometimes out of sync

Kitty advises on business necessities and Break chancing



Q My company employs 18 people and we wish to introduce a computer for Purchase and Sales Ledger and Wage Roll. I have a BBC B micro with cassette tape storage. What other equipment do I need? What information is available?

Is it possible to do this or should I consider a different computer?

C N Choyce
Gloucester

A Taking your last question first, yes, your BBC micro will certainly be able to cope, but you will need to choose your software with care.

In terms of extra hardware, you'll need disc drives and a printer. As this issue of *Acorn User* is on the theme of discs, I'll leave it to you to read the articles by Bruce Smith and Vincent Fojut, to help you decide what you should buy.

Printers have been reviewed extensively in *Acorn User* over the past two years. Basically, there are two main kinds – daisywheel and dot matrix. The former produces a type identical to that of a daisywheel typewriter and also allows you to change character fonts simply by replacing the daisywheel. The latter outputs lower-quality print, but some printers, such as the Taxan Kaga, have a near letter quality (NLQ) feature that produces a good quality print. The main advantage of the dot matrix printer is that it has a graphics capability, allowing you to produce screen dumps of graphical displays.

Choosing software is probably your biggest and most crucial decision. Failure to make the right choice will ultimately lead to problems. A suitable suite might be the *BuSIness Duo Sales & Purchase Ledger* by Systematics International (reviewed in the May issue, page 136).

As you need to purchase a disc drive then the Torch Z80 pack might also be worth considering. Torch is currently offering a £100 discount.

I would strongly recommend you to get yourself along to a reputable dealer and discuss your exact needs, try the software out for yourself and ask lots of questions. Before you go, write down exactly what you want your software to do for you. Only buy when you are convinced that you are going to get what you really want. A day trip to this year's *Acorn User* show would probably be a good source of information.

Q Although the BBC micro keyboard is excellent, I find that the Break key is too sensitive and can be easily pressed accidentally, which is a disaster if you have just loaded a long program. How can I disable the Break key?

Tapas Maiti
Stoke-on-Trent

A Pressing the Break key need not be a disaster. You can normally restore your program simply by typing OLD and then Listing. Problems can occur if you have a disc interface fitted and have deliberately lowered PAGE from its default value (normally &1900 if no other ROMs are fitted) to, say, &1200. You could try typing:

```
PAGE=&1200
OLD
```

but this will probably not restore your original program. If you had reset PAGE to higher than normal value then you should have no problems restoring your original program, simply by resetting PAGE and typing OLD.

Disabling the Break key is not easily done. The command *FX200 can control the action of the Break key to a certain extent. Some programs use *FX200,2 to clear memory when the Break key is pressed. The normal action of Break may be restored with *FX200,1.



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GP100	£4.95	£3.95
GP250	£5.95	£3.95
KAGA KP810	£5.95	£4.75
CANON PW1080	£5.95	£4.75
MICROVITEC MONITORS	–	£5.50

KAGA KP810 NLQ PRINTER

This Dot matrix printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, Proper adjustable tractor feed, half speed quiet mode and 3K buffer. The printer is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets. Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£252** (£7 carr.)

RS232 interface + 2K buffer to connect to other micros. **£89**

KAGA KP910 Printer

Similar to the KP810 but with 17" carriage for wide print. Gives 156 columns of normal print or 256 columns in condensed mode. Ideal for printing out spreadsheets.

ONLY **£339** (£7 carr.)

NLQ FONT DESIGNER

For this NEW ROM (latest in NLQ Technology from Watford) please see later pages of this advert.

EPSON HI-80 PLOTTER

The latest addition to the popular range of EPSON Printers/Plotters. Prints in upto 10 colours. Has many more features. Please write in for spec sheet.

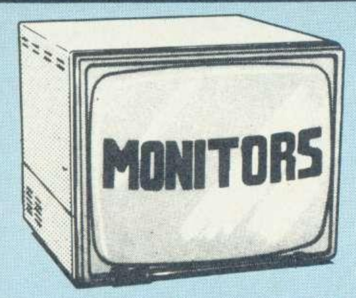
Price: Only **£399** (£7 carr.)

PRINTER LEAD

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	**£6**
Extra long (6 feet long)	**£9**

We can supply leads to any required length.



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop.

MICROVITEC

- 1431 – Medium resolution as used on the BBC television computer programme **£175**
- 1451 – High resolution, suitable for word processing in mode 0 .... **£237**
- 1441 – High res. exceeds the capabilities of the BBC micro **£385**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£285**
- Dust Cover for Microvitecs **£5.50**

All Microvitec Monitors are 14" RGB in their distinctive right angle sturdy metal case or the new beige plastic case. They are supplied complete with connecting lead to the BBC and a 3pin mains plug.

KAGA

- KAGA KX1201G Hi-res Green Monitor **£90**
- KAGA KX1202G Ultra-Hi-Res Green Monitor **£105**
- KAGA KX1203A Ultra-Hi-Res Amber Monitor **£105**
- KAGA Vision 2, Hi-Res, RGB Colour Monitor **£225**
- KAGA Vision 3, Ultra Hi-Res, RGB Monitor **£310**

All KAGA monitors are 12" units housed in a professionally finished beige plastic cabinet. They all have as standard, a genuine etched anti-glare screen.

ZENITH

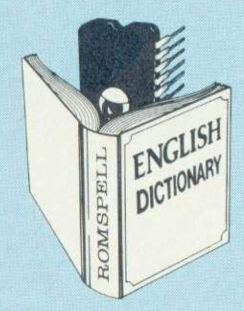
12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too – you can really see the detail that has been put into the graphics **£66**

LEADS

BNC Lead for Zenith or Philips **£3**
RGB lead for KAGA **£5**
N.B. Carriage on Monitors **£7** (securicor)



ROM-SPELL



ROMSPELL is the new fast Spelling Checker ROM from Watford, Packed with excellent features, ROMSPELL is probably the most advanced spelling checker available for the BBC micro.

Features include:

- 30,000 word dictionary
- One pass check
- Two pass check
- Ambiguous word check
- Basic access to ROMSPELL
- Immediate entry check

ROMSPELL is fantastic value at **£25**

(Please specify 40 or 80 tracks when ordering)

BBC MICRO WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

EXAMPLE PACKAGE
BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 400k Epson drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 × 3M disc, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

NEW LOW PRICE

Only £999



ACCESS HOT LINE (0923 50234)
24 Hours

THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

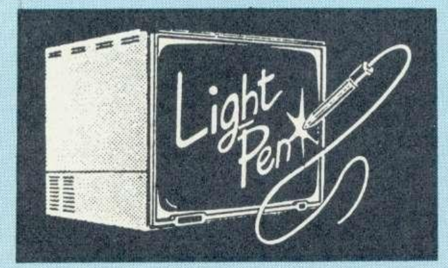
Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

This book is superb value at only **£5.95** (Book – No VAT)

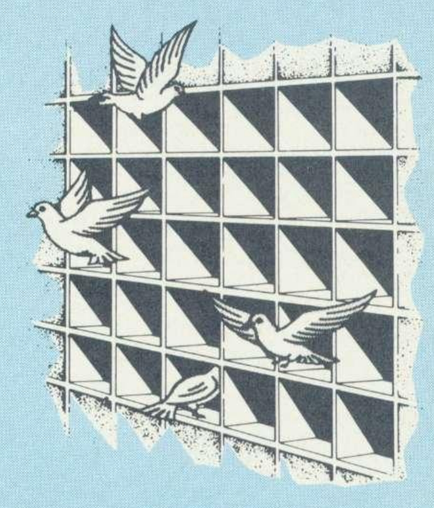
LIGHT PEN



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see elsewhere in this ad).

Only **£23**
(For software on disc please add £2)

DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.

On disc at **Only £17**
(Please specify 40 or 80 track when ordering)
(Please write in for technical specifications)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer. File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.
Operations supported are –, +, *, /, +–999999 9999.9999 and compare facilities =, >,<>>=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, and, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

DATAGEM

Gemini's 24K ROM based DATABASE Management System
Special Offer: **£99**

Continued ⟶

Quality Disc Drives from Watford Electronics

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

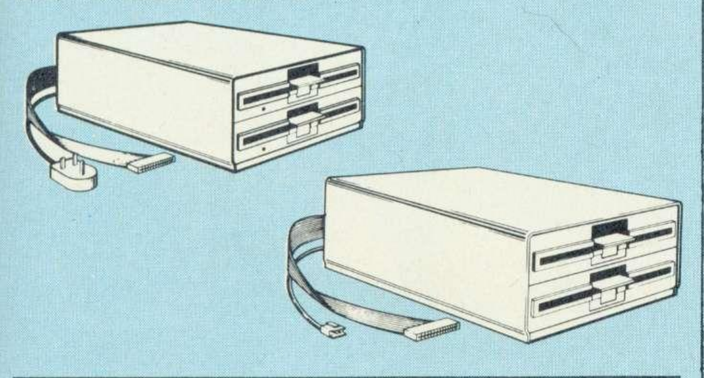
With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them. Users of Acorn's DFS will find that they need to pay the extra for switchable drives if they wish to use 40 track discs in an 80 track drive.

The drives we supply are fast (3ms track to track, 15ms settle), quiet and have a low power consumption (average well under 1 amp). Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

Names you can trust, at prices you can afford!

If you look around the popular BBC micro press, you will find that the prices we quote are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today!

All disc drives advertised here will operate in double density mode with the appropriate interface and software.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS100 £85		CS100 £115	
200K (360K)	CLS 200 £89	CLD200 £165	CS 200 £120	CD200 £185
400K (720K)	CLS 400 £120 / £122 CLS400S	CLD 400 £170	£140 CS 400S	CD400 £189
800K (1.44M)		CLD800 £232 / £242 CLD 800S		£265 CD 800S

- TWIN drive CASE, with Power Supply & Cables **£40**
  Securicor carriage on Disc Drives £5

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

Suffix S = 40/80 Switchable

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford Electronic's new book entitled 'MYSTERIES OF DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

There is even a handy section describing the phrases you are likely to encounter, and how to interpret them. This book must be an essential purchase at £5.95, especially if you own or are thinking of buying a disc system.

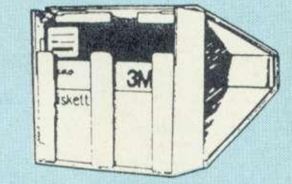
£5.95 (Book No VAT)

3M – 5¼" DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

FREE FREE FREE

Watford Electronics are now the biggest single distributor of 3M's 5¼" floppy discs throughout the UK. As a gesture of thanks, we are this month giving away absolutely FREE this Disc library case with every box of 10 discs purchased from us.



DON'T SETTLE FOR LESS, BUY THE BEST

- *10 × S/S D/D 40 Track Diskettes* **£13**
- *10 × D/S D/D 40 Track Diskettes* **£18**
- *10 × S/S D/D 80 Track Diskettes* **£22**
- *10 × D/S D/D 80 Track Diskettes* **£24**

DISC ALBUMS

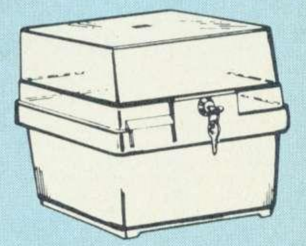
Attractively finished in beige leather-look vinyl, these conveniently store upto 20 Discs. Each Disc can easily be seen through the clear view pockets.

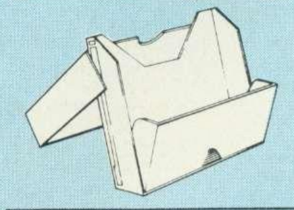
£4.25

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

M35 – holds upto 40 discs **£12**
M85 – holds upto 95 discs **£15**





PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£1.80**

FLOPPY HEAD CLEANER KIT

The heads in floppy disc drives are precision made and very sensitive to dirt. Drive manufacturers recommend that you clean the heads approximately once a week. Unless your home or office is dust free, one of these Kits is a very sensible precaution against losing valuable data. A dirty head can destroy many discs before you realise the trouble. Very simple to use.

£9

DUST COVERS (For our Disc Drives)

Single (without PSU) **£3.20** Twin (without PSU) **£3.85**
Single (with PSU) **£3.25** Twin (with PSU) **£3.90**

Continued →



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £22

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00



THE NLQ DESIGNER

The Kaga Taxan KP810 and KP910 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your pronter so that it is available immediately when you turn it on.

A 40/80 track format disc containing 3 example fonts is included in the package.

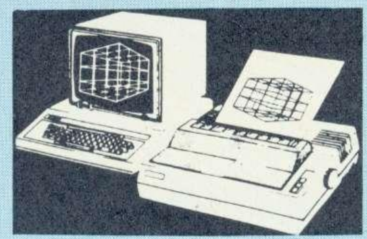
(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though – work is in development!)

NLQ DESIGNER & FONT DISC **£25**

INDIVIDUAL Preprogrammed FONT ROMS **£15**

(Please write in for further details on both the NLQ DESIGNER and the individual font ROMs available.)

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:
- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £24 it must represent excellent value for money and surely cannot be beaten".
Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/120/200/400, etc. etc.
Price including comprehensive manual

£24

ADE

'Systems' complete program development package in a 16K ROM. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY **£43**

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) **£49**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £9

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £8

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 EB 50 and converted typewriters EX43/44 & 55.

Only: £8

BEEB PRINTER ROM


"Makes Printing Childs Play"

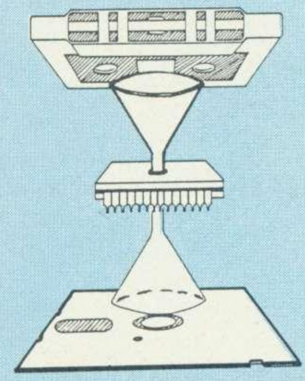
This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:
★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.
★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.
★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.
★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.
★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24



TRANSFEROM

(Tape to Disc Utility)



After months of top secret development, we are now able to supply details of this advanced and sophisticated utility ROM for the BBC micro. Just look at the features:

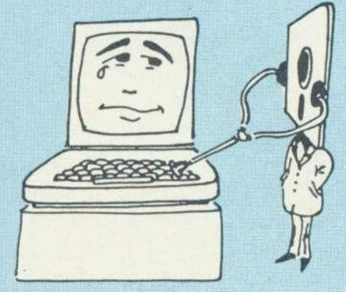
- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£22.00

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

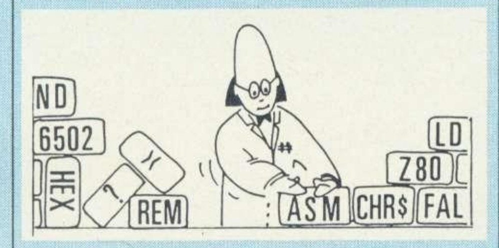
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Trial Price
Only £15.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £45**
Please specify 40 or 80 track disc when ordering.

Special Offer

Purchase a copy of ROMAS and our EPROM programmer (retail price £113.00), and we'll give you the very special price of:

£99.00! (£4 p&p)

ULTRACALC 2

The mark 2 version of the BBC Publications extremely popular electronic spreadsheet ROM.

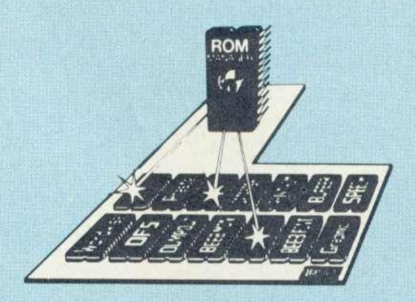
Only: **£66**

DELSYS

Digital Electronic System

The DELSYS project introduces the BBC Micro user through a structured approach to the fundamentals of microcomputer hardware design. For the first time an opportunity to grasp and understand the importance of Digital Electronic Systems in control applications is offered to owners of the BBC Micro. This is achieved by tackling a set of hardware project packs of varying degrees of complexity.
Introductory packs will educate users in the fundamentals of digital circuits by using practical experiments. A easy to understand manual explains the constructor, the operations and procedures in a step by step guide to basic design principles.
The first of the DELSYS project packs introduces the user to the concepts of logic gates, fundamental chip selection from technical data sheets, interfacing and bus structure techniques using the construction of a set of "Traffic Lights" as an example.

ROM MANAGER



'Provides comprehensive management of all your installed ROMs – BEEBUG Nov. '84'.
This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

Price **£20**

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your programs from cassette to disc. It copes with 'locked' files and full length adventures (up to &6E blocks long) and programs that load below &E00. Disc Executor is simple to use and provides menus to prompt the user along the way. Disc Executor will cope with the vast majority of tapes. (Please note that Disc Executor is not compatible with double density disc interfaces – keep reading our adverts though!)

Price only **£10**
(Please specify whether 40 or 80 track disc when ordering)

Continued →

Nightingale Modem

Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

SPECIAL INTRODUCTORY OFFER

(Price includes COMMSTAR ROM & comprehensive manuals) **£119**

Nightingale Modem without software **Only £99**

COMMSTAR ROM package only **£29**
(P&P on modem £2.00)

Auto Dial/Auto Answer Board **£48**
Auto Dial Utilities Disc **£9.50**
OBBS Bulletin Software **£20.00**

DEMON Modem Package

THE MODEM

300/300 baud full duplex (orig and ans)	Auto answer
	Auto dial
1200/75 baud full duplex	Auto baud rate detect
75/1200 baud full duplex	CCITT/BELL standards

THE SOFTWARE

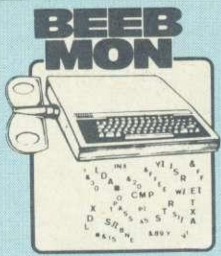
Full baud rate support
1200/1200 full duplex 4800/4800 full duplex
2400/2400 full duplex 9600/9600 full duplex
Auto dial
Auto answer
File transmission in 3 protocols
Prestel terminal
Mainframe type terminal
Two window operation

Supplied with a comprehensive manual and all necessary leads.

Price: **£69.95** (Carr. £3)

Auto dial software disc **£4.25**

(Please specify 40 or 80 track)
(Note: Demon is not BT approved)



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS. Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of code.

Superb value for money at only: **£24**

DISASSEMBLER ROM

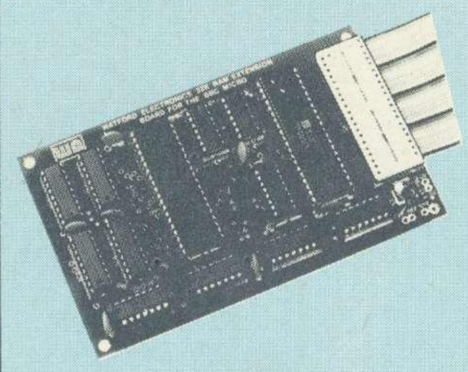
Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

ONLY **£18**

Please write in for technical details.

32K RAM/

PRINTER BUFFER EXPANSION BOARD



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- In "VIEW", type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory – recommended by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc).
- Ensure COMPATIBILITY with a vast range of hardware (including Watford & ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable.
- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages.

Only: £65

(Price includes a comprehensive manual and the ROM)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

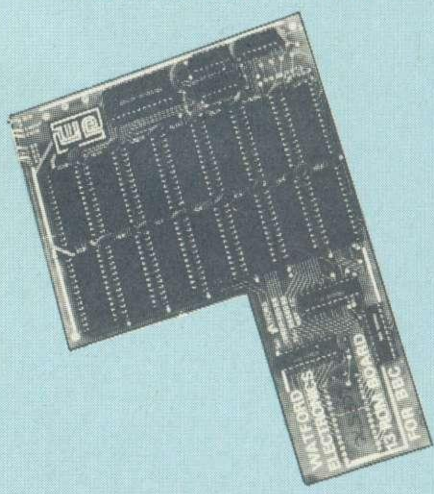
BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.
You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.
A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

ONLY **£32**

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.
Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead).
Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer.

Supplied ready-built and tested complete with fitting instructions.

Only £30

PCB NI-CAD Battery for ROM Boards.
£2.75

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
INTER-SHEET	£49
TERMI	£27
COMMUNICATOR	£58

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

WORDWISE PLUS

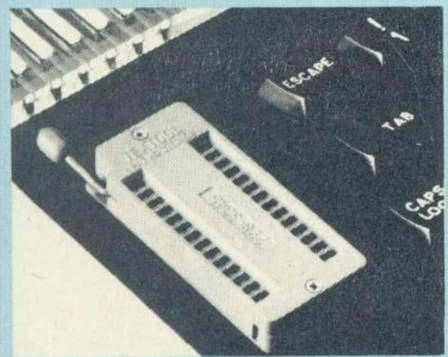
Now available from stock **£47**

WORDWISE PLUS UPGRADES

Existing users of Wordwise can upgrade to WORDWISE + for £17. Please return the old WORDWISE package complete with Chip and MANUAL with your remittance and we will send you the new WORDWISE + package.

£19

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

● Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.

● The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.

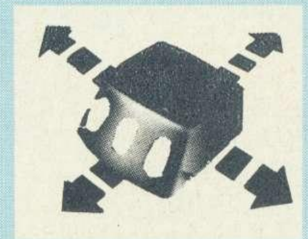
● All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

● This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£18**

THE AMX MOUSE

The AMX Mouse package, of which WE are the largest single distributor in the entire country, is an incredible addition for your BBC Micro. This very popular package is truly brilliant value at only £68.50.



OUR SPECIAL PRICE

ONLY: £68.50

FREE FREE FREE

This month we are giving away the sophisticated COLOUR ART package absolutely FREE with every purchase of the AMX Mouse from Watford.

AMX Desk package	£19.00
AMX ART package	£11.50

COLOUR ART!

As seen at the Micro User Show

Watford Electronics has long been a source of innovation in the BBC field; e.g., we were the first to market a ROM board. Well now We've done it again!

The AMX Mouse is, as we are sure you already know, a very easy to use and powerful drawing package. Throughout the country, there is no single bigger distributor of this excellent package than Watford Electronics. To celebrate this fact, we are, during this month only, including FREE with every AMX Mouse package purchased from us the superb piece of software called COLOUR ART.

This novel program allows you to add COLOUR to any drawing produced with your AMX Mouse package, and really bring those pictures alive. Not with just any colours, mind you, but a full range from up to 255 different shades! It's simplicity itself to use this "painting by numbers" painter to create simple, striking and powerful images to please the eye.

Price **£13**

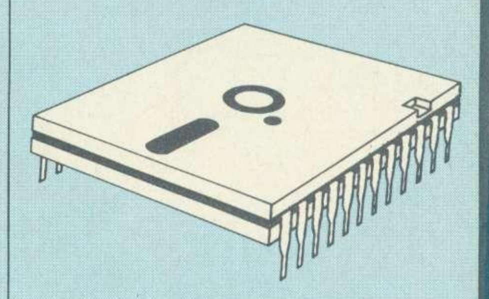
(please specify 40 or 80 track disc when ordering)

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

16K DISC RAM



This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- All existing ROMs can be stored on disk and used in DISC RAM.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £35

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £35

Continued


BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro)	£6.95
35 Education Programs for BBC	£6.95
40 Educational Programs for BBC	£5.95
100 Programs for BBC Micro	£6.95
6502 Application Book	£12.50
6502 Assembly Language Program	£13.95
6502 Assembly Language Subroutines	£19.95
6502 Machine Code for Beginners	£5.95
6502 Machine code for Humans	£7.95
A young persons guide to BBC Basic	£4.50
Advanced Machine Code Technique for BBC	£7.95
Advanced Programming for the BBC Micro	£6.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
BBC BASIC for Beginners	£7.95
BBC BASIC	£5.95
BBC DIY Robotics & Sensors	£6.95
BBC Forth	£7.50
BBC MICRO add on guide	£6.95
BBC Micro An Expert Guide	£6.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro **ROM PAGING** System Explained	£2.00
BBC Micro Revealed	£6.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
Basic Programming on BBC Micro	£5.95
BBC Software Projects	£5.95
Brain teasers for BBC micro	£5.95
CP/M Handbook with MPM	£13.95
CP/M The software BUS	£8.95
Creating Adventure Programs on BBC Micros	£6.95
Creative Animation & Graphics	£7.95
Creative graphics on BBC Micro	£7.50
Complete Programmer for BBC	£5.95
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
DIY Robotics & Sensors with BBC	£6.95
Easy Programming for the BBC Micro	£5.95
Exploring FORTH	£6.95
Further Prog. for BBC Micro	£5.95
FORTH on the BBC Micro	£7.95
Forth Programming	£14.40
Functional Forth for the BBC Micro	£5.95
Games BBC Computer Can Play	£6.95
Getting more from your BBC & Electron	£6.95
Graphs & Charts on BBC Micro	£7.50
Graphic Art for BBC Computer	£5.95
Handbook of Procedure & Functions for the BBC Micro	£6.95
Introducing the BBC Micro	£5.95
Introducing LOGO	£5.95
Introduction to PASCAL	£14.95
Let your BBC teach u to program	£6.45
LISP	£9.25
LISP Cassette	£15.50
Logo Programming	£8.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering CP/M	£16.50
Programming the 6502	£13.95
Programming the BBC micro	£6.95
Programming the Z80	£16.95
Programming with Graphics	£5.95
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Complete Programmer	£5.95
The Epson FX/KAGA PRINTER Commands REVEALED	**£5.95**
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Wordstar & CP/M made easy	£6.95

NEW NEW NEW NEW

BEEB VIDEO DIGITISER THE LATEST IN HIGH TECH FROM WATFORD

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Features offered by this package include:

- The adding of pictures or written text to typed documents.
- Unattended recording of scientific data.
- Entry of real images into graphics programs.
- Generation of computer images.
- Slow scan television; sending images via a modem or radio.
- Security.
- Input from any video 1v video source.
- Full resolution in Modes 0,1 or 2.
- 1.6 seconds scan time.
- Up to 8 grey levels
- Manual or Auto level control
- Connects to user port

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

Introductory price
Digitiser Unit & ROM

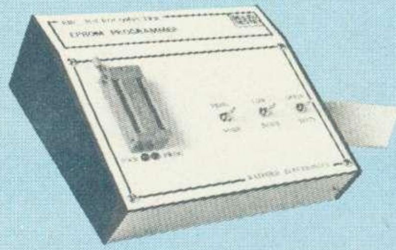
£89 (Carr. £2)

PLINTHS FOR BBC MICRO AND PRINTERS

Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE

The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:

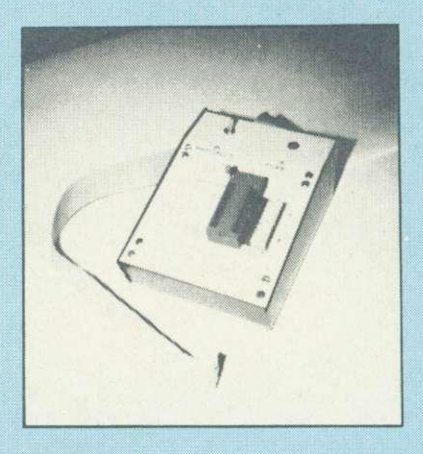
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.

Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

SPECIAL OFFER £69
(£3 carr.)

LOW COST 'DIN' EPROM PROGRAMMER

A high performance, low cost, self contained 'DIN' EPROM PROGRAMMER for the BBC Micro. Plugs into the BBC Micro's user port.

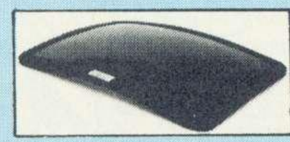


The features are:

- Will program 2716, 2732, 2532, 2764 & 27128 EPROMs.
- Copy Eprom into memory and compute checksum.
- Blank check EPROM.
- Program EPROM from memory.
- Verify programmed EPROM and display checksum.
- All * commands may be used from menu mode.
- High speed programming on 2764 & 27128.
- Machine code SOFTWARE supplied in ROM.

Only: **£49.50** (carr. £2)

ANTI GLARE MONITOR SAFETY SCREEN



HEADACHES? TIRED EYES? Don't take pills – Use a Watford Electronics anti-glare filter!

- Made in Britain by a long established glass maker.

Available in 12" & 14" versions – please specify the exact monitor type when ordering.

Special Price: **£16.00** (carr. £1)

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. Suitable for computers, Hi-Fi, Fridge Freezers etc. Max Surge current 2KAmp; max. Voltage 250. Essential for serious computer users.

Protection for only **£9.50**

FLEXIBLE KEYBOARD CONNECTOR

A 'Keyboard to Micro' replacement jumper lead.

£4.95

ATTACHE CARRYING CASE for BBC Micro

The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price **£11** (£2 carr.)

DATA RECORDER AND ACCESSORIES

Top quality slimline portable cassette recorder designed specifically for use with home computers. Mains/Battery operated with tape counter. **£20**

DATA CABLE to connect recorder to BBC **£2.50**

DATA CASSETTES

Top grade tested C12 Data cassettes supplied in library cases **35p** each; 10 for **£3.20.**

ASSORTED CONNECTING LEADS

(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug	
to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
to 7 pin DIN Plug	£2.50
to 3 Jack Plugs	£2.00
6 pin DIN to 6 pin DIN Plug (RGB)	£2.50
MONITOR LEADS	
KAGA/SANYO Colour Monitor Leads	£5.00
Monochrome monitor leads BMC to Phono	£3.00

DISC DRIVE POWER LEADS

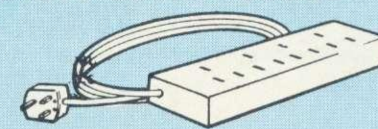
Supply from BBC power supply to standard Disc Drive connector.

Single **£3.00** Dual **£3.75**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles (15 pin 'D')	110p	215p
BBC Power Plug 6 way	80p	–
Disc Drive Plug 4 way	75p	–

4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug. **£9.99**



ACCESS HOT LINE
0923 50234
24 Hours

ROM EXTRACTION TOOL

This extremely useful tool allows trouble free IC removal from your computer. No longer do you have to weald a screwdriver at your valuable ROM software. Instead this IC extractor distributes the removal force over the whole body of any 24 or 28 pin device, thus preventing undue damage to your Chip. Isn't £1.75 a small price to pay to protect your ROMs stature?

£1.75

ADVENTURE GAMES (level 9)

COLOSSAL ADVENTURE	£8.50
ADVENTURE QUEST	£8.50
DUNGEON ADVENTURE	£8.50
SNOWBALL ADVENTURE	£8.50
LORDS OF TIME	£8.50

Please add £2.50 for Discs

MISCELLANEOUS

28 pin ZIF SOCKET (Textool) £6.95

28pin DIL PLUG

SOLDER type	£2.90
IDC CRIMP type	£3

RIBBON CABLE

28way **55p/ft;** 34way **60p/ft.**

8way DIP SWITCH **£0.85**

CHIP SHOP

7438	40p;	74LS00	30p
74LS04	25p;	74LS10	25p
74LS123	£1;	74LS163	70p
74LS244	95p;	74LS245	£1.60
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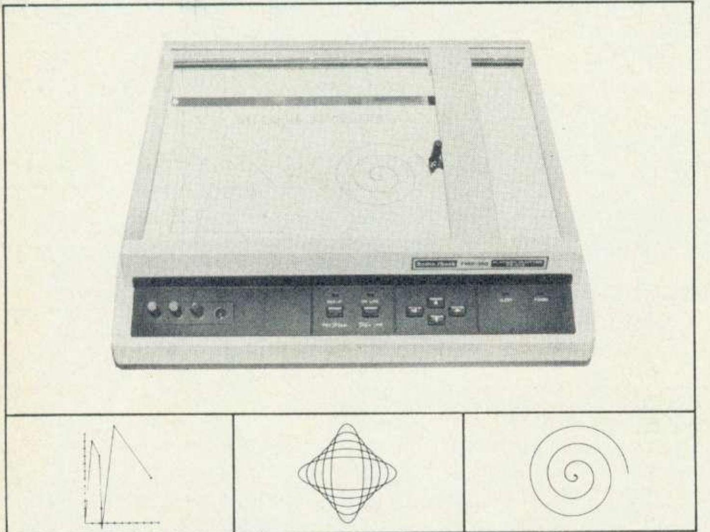
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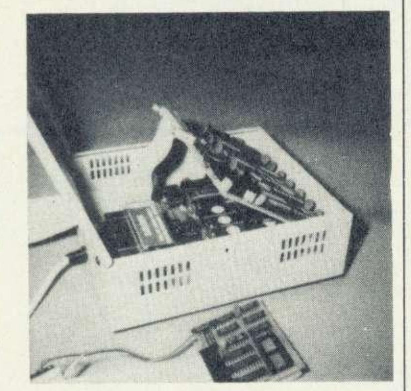
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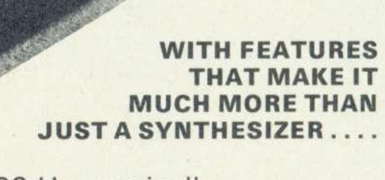


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PLEASURES OF PASCAL

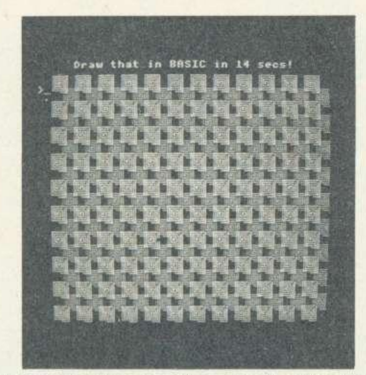
Simon Williams compares three implementations of the language

ILLUSTRATION BY MARTIN HANDFORD

BBC BASIC is one of the fastest and best-structured implementations of an interpreted language on a micro. It is possible to write quite long programs, up to several hundred lines, and still keep the whole thing readable and reasonably well constructed. You pay several penalties, however, for using an interpreted language like Basic, where commands are converted into machine code each time a program is run.

The first is speed. Although BBC Basic is fast in relation to other Basics, when compared to other languages which are compiled rather than interpreted, Basic is quite a slow-coach.

An interpreted language is one where each instruction is translated from a 'high-level' command to a 'low-level' machine code instruction each time the program is run. A compiled language on the other hand, does the translation only once. The machine code program that results (called the 'object' code) is run directly, some-



This mosaic was produced using the listing on the right

times at speeds close to purpose-written machine code.

The second Basic penalty is size. When learning to program, you're not usually worried about the length of the code created (although graphics programs on the BBC micro can soon run short of memory).

As programs get longer, however, the economy of the language becomes more important.

If you want to use meaningful variable names, and to set out your programs well, there will be a corresponding increase in the size of a Basic program. Although nice in theory, when you're working with limited memory, the ideas of structured programming may have to be sacrificed to squeeze the program in.

Why all this talk of Basic, in a discussion of Pascal? Mainly because Pascal, once you get used to its 'fussy' syntax (by Basic standards), removes both these penalties, and discourages programming which isn't properly thought out.

All Basics have their roots in Fortran, a language written mainly for scientific uses. Pascal, however, takes many of its ideas from Algol, an algorithm language dating from 1960. Pascal was created about 10 years later by Professor Niklaus Wirth in Switzerland. He wanted a language which had at its core a strong structure. Pascal contains a number of different structures, including all those in Basic. Those that are shared by the two languages are nearly always more powerful in Pascal. For instance, the ON . . . GOSUB 11, 12, 13 . . . construction in Basic will perform the subroutine starting at 11 if the test condition evaluates as '1', 12 if it evaluates as '2', and so on.

The equivalent statement in Pascal is case . . . of . . . 1: . . . 5: . . . 35: Here the condition between 'case' and 'of' is evaluated. If the result is 1, the routine following the label '1:' will be performed. If the result is 5, the routine following '5:' will be actioned, and so on. You can define labels as any numbers you want, and test for that result.

```
program MOSAIC(input,output);

var COUNT1,COUNT2: integer;
    XPOS,YPOS: integer;

procedure TILE(INCR,COL:integer);
begin;
   gcol(0,COL);
   plot(1,INCR div 2,0);
   plot(1,0,INCR);
   plot(1,-INCR,0);
   plot(1,0,8-INCR);
   plot(1,INCR div 2,0);
   INCR:=INCR-16;
   if INCR>4 then TILE(INCR,COL);
end;

begin;
mode(1);
write(osvdu,5);
for COUNT1:=1 to 12 do
   begin
   for COUNT2:=0 to 9 do
      begin
      XPOS:=COUNT1*100;
      YPOS:=COUNT2*100;
      move(XPOS,YPOS);
      TILE(64,2);
      if COUNT2<9 then
         begin
         move(XPOS+50,YPOS+50);
         TILE(64,1);
         end;
      end;
   end;
write(osvdu,4);
write('      Draw that in BASIC in
14 secs!');
write(osvdu,28,35,0,35,0);
end.
```

```
program bounce (input,output);

const
    ESCAPEpressed = false;
    PAUSE = 30;

var
   row, col,
   rowinc, colinc,
   count : integer;

begin
  row := 0;
  col := 0;
  rowinc := 1; colinc:= 1;
  page;
  repeat
    for count := 1 to PAUSE do;
    vdu (31, col, row, 32);
    col := col+colinc;
    row := row+rowinc;
    if (row > 23) or (row < 0) then
      begin
        rowinc := -rowinc;
        row := row+rowinc+rowinc;
        sound (1,-10,100,2);
      end;
    if (col > 39) or (col < 0) then
      begin
        colinc := -colinc;
        col := col+colinc+colinc;
        sound (1,-10,50,2);
      end;
    vdu (31, col, row, 111);
  until ESCAPEpressed
end.
```

Listing 1. 'Bouncing ball' program written in Acornsoft's ISO Pascal, with PAUSE set to Ø

You can even make them words. In Pascal, the following is permissible:

case size of
 small:
 medium:
 large:

Here the variable 'size' would be the Pascal equivalent of a string. If it contained the word 'small' when tested, the routine after the 'small:' label would be executed. If it was 'medium' or 'large', the corresponding routines after the 'medium:' and 'large:' labels would be run instead.

The variety of structures in Pascal will cope with almost any problem faced by the programmer. As well as the case . . . of construction, the following are Pascal structures:

- if . . . then . . . else
- for . . . to . . . do
- while . . . do
- repeat . . . until
- procedures
- functions

This list may not look much bigger than that for BBC Basic, but it's important to remember that each is more sophisticated in Pascal.

If you look at a typical short Pascal program (listing 1), you should notice several main differences between it and the equivalent Basic. The most obvious of these are the lack of line numbers and the use of lower case characters. Pascal doesn't need line numbers for reference; instead, it relies on a strong structure. Although Pascal does have a goto statement, it is seldom used, and can only reference a label, defined at the start of the program.

Typing characters in lower case is a convention. Most Pascal compilers don't distinguish between upper and lower-case and you can use both.

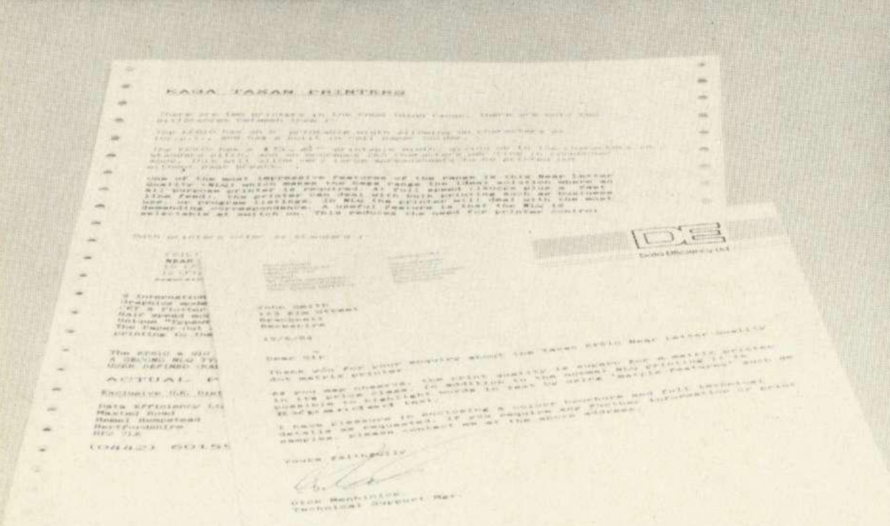
Pascal's layout is very much a question of taste. The language is quite fussy about having at least one space between adjacent variables and operators. If you want to add more spaces, however, or put in blank lines or indentations, you're quite welcome to. These layout facilities, and the ability to use long variable names, present very little overhead when the program is compiled. You can afford to be generous and aim for a good, readable listing.

The way Pascal gets around the overhead normally created by using long variable names is to set up a table of these at the start of the object program. This is why variables, constants and labels must all be defined at the start of the text program (the 'source' code), under appropriate headings.

Variables in Basic can be of three types: integer, floating point (sometimes called 'real') and string. These are also supported in Pascal. In addition, you may define your own. For example, you could have a variable of type 'micro' which could only hold the values BBC, Electron, Spectrum, 64, CPC 464. This may seem a difficult con-

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```
 10 REM PROGRAM x10
 20
 30 DIM A%(1000)
 40 N%=0
 50 REPEAT
 60   N%=N%+1
 70   A%(N%)=N%*10
 80   UNTIL N%=1000
 90 END
100 REM 3.3 secs in BBC BASIC
110 REM 108 bytes of code
```

```
program x10 (output);

var
   n:integer;
   a:array [1..1000] of integer;

begin
n := 0;
repeat
   n := n+1;
   a[n] := n*10;
until n = 1000;
end.
( 2.9 secs in Acornsoft Pascal )
( 106 bytes of object code )
```

```
 10program x10 (output);
 20
 30var
 40   n:integer;
 50   a:array [1..1000] of integer;
 60
 70begin
 80n := 0;
 90repeat
100   n := n+1;
110   a[n] := n*10;
120until n = 1000;
130end.
140( 1.8 secs in Oxford Pascal )
150( 105 bytes of object code )
```

```
++listo 14
 0 PROGRAM times10;
 1
 2 VAR
 3    n : INTEGER;
 4    a : ARRAY[1000] OF INTEGER;
 5
 6 BEGIN
 7 n := 0;
 8 REPEAT
 9    n := n+1;
10    a[n] := n*10;
11 UNTIL n = 1000;
12 END.
13 ( 2 secs in HCCS Pascal T )
14 ( 2104 bytes of object code )
++
```

Listing 2. Multiplication benchtest with Pascal and Basic versions

cept, but once you have sorted it out, it can be useful in organising programs.

Because of the relatively 'free-form' layout adopted with Pascal, the compiler needs to know where each statement starts and finishes, and this delineation is performed by punctuation. Each statement is separated from the next by a semi-colon, and objects within a statement (the parameters in a procedure, for instance) by commas. The full stop is only used at the end of the entire program, and thus is very important.

The equals sign, used in assignment statements, is prefixed with a colon. This is to emphasise that it isn't an equals sign in the algebraic sense. The phrase

number := number + 1

makes no sense as an equation, but in computing terms is legitimate. The equals sign *is* used on its own in test conditions such as:

if today = Monday then . . .

There are three main versions of Pascal available for the BBC micro: Pascal T from HCCS, ISO Pascal from Acornsoft and Oxford Pascal from Oxford Computer Systems. Each sets about implementing the language in a different way, and we'll have a quick look at each.

Pascal T is a budget system which is fairly idiosyncratic in the way it works. The editor and compiler were both written in Forth, and some of that language's structures are carried through to HCCS Pascal. The language is supplied in a 16k EPROM.

Text is entered on a 32-line 'screen', to which the editor automatically assigns line numbers. If you want a program longer than this, it must be subdivided into procedures or functions that can be used individually. Once the program is compiled, it is added to the Pascal T 'directory' and may be called for execution by name.

Pascal T compiles to an intermediate code, which is run directly when you call the program. This is quite fast, but takes up considerable space, even for a short program (table 1).

The language only supports integer numbers between +/−32767. This rules out any 'real' arithmetic, which can be quite a restriction when programming. The implementation is really intended primarily for learning Pascal, rather than using it seriously.

Oxford Pascal is the newest version. It comes as an EPROM with associated cassette or 40-track disc. This is a much fuller implementation than HCCS. It supports floating point numbers as well as integer and character (string) types. The editor mimics that used by Basic, and should be familiar to Beeb users.

Oxford Pascal can compile code in one of two ways. You can use the resident compiler to produce object code in an internal format which can only be run on machines with the EPROM installed. If you use the resident compiler, you must have room for both source and object code in memory.

	Program ×10		Program stripes	
	Execution time	Length	Execution time	Length
BBC Basic	3.3	108	274.2	109
Pascal T	2.0	2104	Not Run	
ISO Pascal	2.9	106	201.8	133
Oxford Pascal	1.8	105	171.2	95

Table 1. How Pascal implementations and Basic compare in terms of speed

```
 10 REM program stripes
 20 MODE 2
 30 colour%=0
 40 FOR row%=0 TO 255
 50   FOR column%=0 TO 159
 60      GCOL 0,colour%
 70      PLOT 69,column%*8,row%*4
 80      colour%=colour%+1
 90      IF colour%>7 THEN colour%=0
100     NEXT column%
110   NEXT row%
120 END
130 REM 274.2 secs in BBC BASIC
140 REM 109 bytes of code
```

```
program stripes (output);

var
  row, column, colour : integer;

begin
  mode(2);
  colour := 0;
  for row := 0 to 255 do
  begin
    for column := 0 to 159 do
    begin
 vdu(18, 0, colour);
 plot(69, column*8, row*4);
 colour := colour + 1;
 if colour > 7 then colour := 0;
   end;
 end;
end.
( 201.8 secs in Acornsoft Pascal )
( 133 bytes of object code )
```

```
 10program stripes (output);
 20
 30var
 40  row, column, colour : integer;
 50
 60begin
 70  mode(2);
 80  colour := 0;
 90  for row := 0 to 255 do
100  begin
110    for column := 0 to 159 do
120    begin
130     gcol(0, colour);
140     plot(69, column*8, row*4);
150     colour := colour + 1; := 0;
160       if colour > 7 then colour
170    end;
180  end;
190end.
200( 171.2 secs in Oxford Pascal )
210( 95 bytes of object code )
```

Listing 3. Coloured stripes test in Pascal and Basic

Alternatively, you can select the disc compiler. This will take its source code from disc, compile it and store an object code file on to any disc surface. The object file can be run independently of the Oxford system, and is a relocatable 6502 machine-code file.

The code produced is very compact, particularly with longer programs, and runs a good bit faster than interpreted Basic. It does make use of routines within the Basic ROM for handling 'real' arithmetic, however, so some calculations may not show a radical improvement.

Acornsoft's ISO Pascal is a big beasty! It comes in two 16k ROMs, one for the editor and one for the compiler. The several years taken to produce it were mainly spent in squeezing a full-feature compiler into 16k.

Acornsoft's has a full-screen editor with comprehensive facilities including search and replace functions. The

source file may be set out exactly as you like, within the constraints of the language itself. In several respects the editor is reminiscent of *Wordwise*.

ISO Pascal compiles to an internal code, which runs about 25 per cent faster than the equivalent Basic program, without generating any more code. Acornsoft is working on a set of 'run-time' routines, which will allow the internal code to be converted to run without the Pascal chips in place.

My original intention in this article was to produce a set of Pascal programs, rather more detailed than simple benchmarks, and compare them on all three Pascal systems. In fact, because of the difficulty of implementing identical programs on each version, the programs are rather simpler than intended.

The first program takes the numbers from 1 to 1000 and multiplies them each by 10, storing the results in a single dimension array (listing 2). This tests the integer arithmetic routines provided in each language, without the burden of screen display. Display routines are governed more by the speed of the BBC micro's operating system than by the language itself.

The second program plots points of cycling colours onto a mode 2 screen (listing 3). This was included to show the speed increase, if any, available from Pascal, over Basic. All versions use operating system routines, via VDU-type calls, to plot graphics, so you might expect little difference in speed.

As table 1 shows, the results are quite varied. The calculation program shows all three systems to be faster than Basic, with Oxford nearly twice as quick. Looking at the length of code generated, all but Pascal T are on a par with Basic. Each Pascal implementation should give better size comparisons as program length increases.

The graphics program shows Oxford Pascal to give a 38 per cent increase on interpreted Basic. Acornsoft Pascal is about 25 per cent faster and Pascal T wouldn't run the program in the available space. (It wasn't considered fair to let it run in mode 5 instead !)

As things stand, the implementations of Pascal available on the BBC micro offer some saving in speed, though you are still not going to get away with writing arcade games in it! Each version does show the fundamentals of the language, and offers the chance of creating well-structured programs, and of dividing them into easily-managed modules. Oxford and Acornsoft are also very economical in the length of object code they create.

Acornsoft Pascal will soon be able to run on BBC micros without the ROMs fitted, which opens up the area of commercial Pascal programs. Oxford Pascal will do it now, and is the quicker of the two. Its editor is not nearly as good as Acornsoft's, though. Pascal T is fine for learning, but has its eccentricities. It is considerably cheaper than the other two.

Widely regarded as a good upgrade path from Basic, Pascal offers many advantages for anybody writing large programs and looking for an increase in speed of calculation.

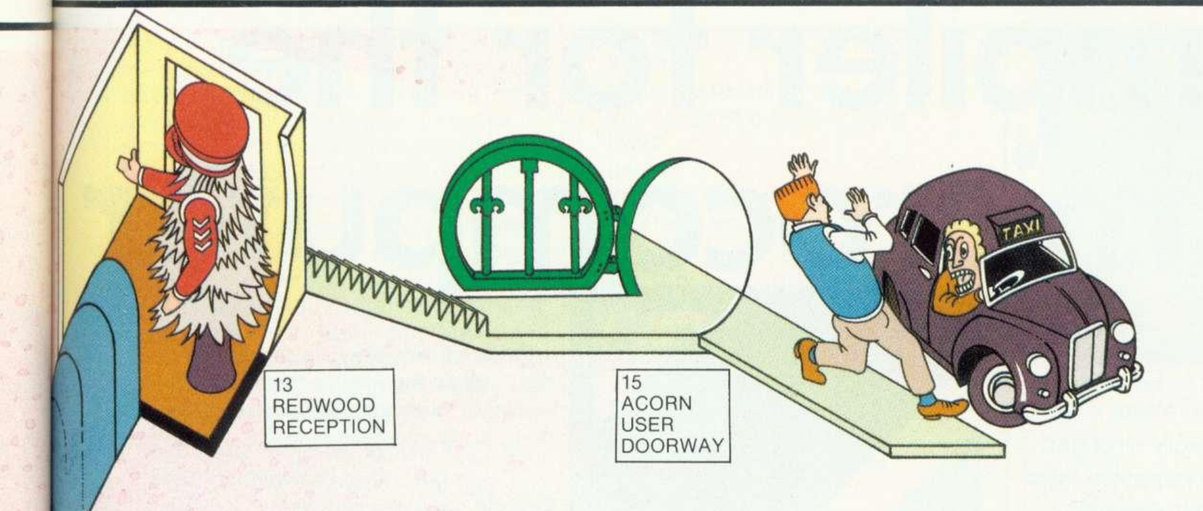
ISO Pascal, £69, Acornsoft, Betjeman House, 104 Hills Road, Cambridge CB2 1LQ. Tel: (0223) 316039.
Oxford Pascal, £49.95 (disc), £39.95 (cassette), Oxford Computer Systems Ltd, Hensington Road, Woodstock, Oxford OX7 1JR. Tel: (0993) 812700.
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Figure 1. Plan of the Acorn User Dungeon

ILLUSTRATION BY RICHARD DRAPER



IF YOU have ever played an adventure game, then you may well be 'hooked' on this exciting form of mental, and in some cases physical, entertainment. If you haven't, it's worth spending a few pounds on a good adventure to start exploring. Eventually, you might like to try to write your own, but it's a task not to be embarked upon lightly. Indeed, a great deal of skill and creativity is needed, so we'll start you off with a simple mini-adventure, which provides a framework for further extension.

First of all, we must ask ourselves what's in an adventure. The answer is 'whatever we wish to put there'. Start by imagining rooms, caverns and lands filled with exotic creatures, and thinking of fates worse than death for your hero/heroines. The first mistake is to think of complexity too early. The main requirement is to solve one or more set problems.

The place to begin is not with the computer, but with a piece of paper and to think up a suitable plot. This has four parts: preamble; scenario/s; problem/s; and characters. Each of these is important, and writing notes on any of them might add to another.

The preamble generally sets the scene. Try to explain how the adventurer is where he/she has appeared. This invariably will be linked into the instructions for play. Our demonstration adventure started life as follows: 'The adventure will be called the *Acorn User* adventure. The player will appear at a random place inside the *Acorn User* Office/Dungeon and will need to find a way out. To arrive at the site, the player will have been either drugged, carried off while asleep, or made to appear by magic.

When refining the storyline, I decided that the appearance would be via a Teleport program containing a deliberate bug. Notice, however, we have decided that both teleportation and magic are acceptable.

The scenarios really form the outline plan of the adventure world. The whole adventure is often a set of interconnected scenes, be they glades, inns, bridges, castles, or chambers as in our demonstration. The design sequence is to take a large sheet of paper and draw a plan of the whole adventure world marking each site, and the routes between sites. Next, give each site a number, and indicate the type and direction of each route.

Then take another sheet of paper and list the numbers of the sites. Second, give each numbered site a name, and finally design a code for each route and direction.

The plan and scenario information for our *Acorn User* adventure are shown in figures 1 and 2. Figure 1 is not a strict plan, but it should be as accurate as possible, so that a room to the east of another *is* shown to the east. Figure 2 shows we are thinking of six possible routes from each room, and this coding needs explanation.

The code we use is six strings of text, representing the possible ways out of a room. In figure 2 look at the Finance Manager's office (room 9). From this room we can travel:

PN2	Passage north to room 2
TW8	Tunnel west to room 8
CE11	Corridor east to room 11
@	No route
@	No route
@	No route

It is important to put the 'no route' codes after the 'valid route' codes, because these will be expanded when describing the routes and directions. Using the '@' character is a simple way of telling the computer to stop the route descriptions. It is important to get the route coding correct, and according to the plan. For example, if a tunnel stretches between rooms 1 and 2, this has to be indicated in both rooms:

	TE2	Tunnel east to room 2
and	TW1	Tunnel west to room 1

The direction component of the code means the player should be able to tell which way he/she can travel to reach the last room visited.

We might decide also that some rooms are dead ends. To tell the player when a dead end is reached, we can add a 'dead end' code. In our adventure we use 'XX0' for this (see room 1 of figure 2).

One type of adventure game specifies that the player must reach a target – for example, a lost person, relic, or room. In this case there are three ways of keeping track of the target:

- Eventually by using a variable, eg, target = 15 or target$ = "gold"
- By making the target the first or last room (if it is a room).
- By adding a code to each target room. This means that we can have several target rooms, each marked in the route list.

In our adventure we use the code 'EE0' to indicate the target room (the dungeon exit). Look at room 15 in figure 2.

It is useful to write a brief description of each room or scene, and incorporate this in the adventure. This adds to the atmosphere, so that instead of just saying: 'You are in the complaints department,' we might say: 'You are in the complaints department. This chamber is thick with the blood of those who came to offer less than praise.'

Now we turn our minds to the problems. Almost every adventure has three types: spatial, wasting, and scene-specific problems.

A spatial problem is usually a maze, created as we draw up our plan. Players should be encouraged to think 'which way?', 'where did I come from?',

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Machine code programs produced directly by some compilers are sometimes faster than intermediate code but, as explained above, they are usually larger. ACCELERATOR normally compiles to the intermediate G-code but a variety of utilities are supplied with the ROM that allow the G-code to be converted into machine code. Machine code programs can only use integer numbers.

Other utilities are also supplied that allow the user to create his own sideways language ROMs.

ACCELERATOR therefore offers the user the choice between efficient G-code compiled programs, or larger but faster machine code.

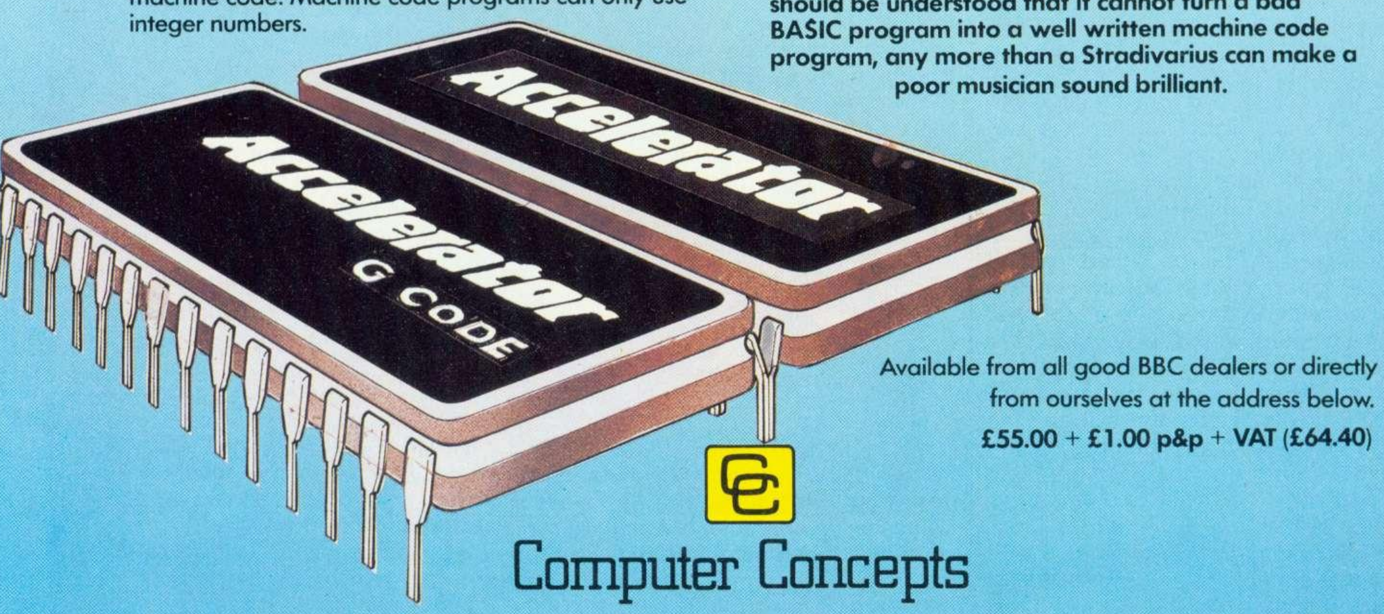
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Note the machine code converter utility programs are supplied on a 40/80 track disc. These require a disc drive to work.

EXCEPTIONS: The EVAL statement cannot be compiled because this must be interpreted at run-time, and in-line assembly language is not permitted as this is not appropriate to an intermediate code compiler. LOMEM, PAGE, TOP and TRACE are not relevant. VAL, RND, FN have been rationalised for predictable type conversion, but can be used as described in the manual.

When converting to machine code no floating point arithmetic is allowed, only integers (16 bit). The ESCAPE key is handled in a slightly different manner.

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'what is the fastest way to. . .?', 'what is the safest way to. . . ?' The better mazes have multiple levels and may have devices which transport players to random destinations. Our adventure has a single 15-room maze, in six directions, up, down, north, south, east and west.

Wasting problems include: tiredness, or reduction of strength due to fighting, carrying or moving between scenes, lack of air, radiation poisoning, heat exhaustion, snow blindness and other nasties. Remember, there should be a way to alleviate these, for example, by finding a bottle of refreshing liquid, or a tank of air. However the effectiveness of the 'cure' should not be so great as to remove the problem altogether. Readers might like to consider table 1 of wasting problems.

In our adventure we have chosen to reduce the amount of air available, by imagining the dungeon is airtight and the supply is turned off. The two remedies are either to escape in time, or find and open certain boxes which will partly replenish the air supply.

Another common task in adventures is to collect items for gain, or to solve a specific problem. For example, a key collected in one scene might open a gate in another. In our adventure, this is demonstrated by having the player open boxes and collect letters to make up a magic word.

Scene-specific problems relate to one room or scene in which players

POOR
You are in Dracula's cave
You can go East, West or South
EAST
Ha! Ha!
You have been zapped
By a laser beam
You are dead
BETTER
You are on the shore
You can go East to a forest
West to the Sea,
North along the beach
South along the beach
NORTH
You are sinking into the sand
EAST
You are up to your waist in quicksand
LOOK
There is a branch above you
GRAB BRANCH
OK.
EAST
You are by a large tree near the beach
You can go East to a glade
West to the Sea
North along the beach
South along the beach

Figure 3. Bad and good dialogue

might find themselves – but there has to be an escape based on resourcefulness. Figure 3 gives an example.

Handling specific problems needs complex programming, often dedicat-

Problem	Increases with	Typical partial cure
tiredness	movement/battle carrying	strength elixir
radiation poisoning	time	anti-radiation pill
heat exhaustion	time/scene	water/river/drink
snow blindness	time/movement	goggles/resting
lack of air	time	air tank/pill

Table 1. Wasting problems

Room no.	Name	Direction/route/to for each of six ways
1	Chamber of Abuse	TE2,XX0,@,@,@,@
2	Phantom Photocopier's Den	TW1,PS9,CE3,@,@,@
3	Writer's Cramped Room	CW2,SU7,@,@,@,@
4	Kitty's Corner.	PE5,CS8,@,@,@,@
5	Quinn's Hideaway.	PW4,XX0,@,@,@,@
6	Complaints Department.	DE7,XX0,@,@,@,@
7	Commander's Chamber.	SD3,DW6,TN13,@,@,@
8	Back Issues Room.	CN4,TE9,DS11,@,@,@
9	Finance Manager's Office	PN2,TW8,CE10,@,@,@
10	Communications Room.	CW9,TD14,@,@,@,@
11	Mad Alex's Cell.	DN8,PE12,@,@,@,@
12	Techno-torture Chamber.	PW11,XX0,@,@,@,@
13	Redwood Reception.	CS7,SU13,@,@,@,@
14	Dungeon entrance.	TU10,XX0,@,@,@,@
15	Acorn User doorway.	SD13,EE0,@,@,@,@

Route string: First position: T(unnel), C(orridor), D(oor), P(assage), S(teps), X(dead end), E(xit). @ is used to tell computer to stop describing available routes. Second position: U(p) D(own), N(orth), S(outh), E(ast), W(est). Positions 3/4: Room number reached by this route.

Note that 'XX0' and 'EE0' should be recognised in the program to give additional information in those rooms. Eg, 'This is a dead end' or 'You have found the exit'.

Figure 2. Coding for possible moves

```
You are in                    Air: 1200
Quinn's Hideaway.
Signs of life have almost
entirely vanished from this
room.

A passage leads west.
This is a dead end.

A box with a 10 sided lid
lies in a corner
What now? _
```

ing a procedure to each scene. Our adventure has only one scene-specific problem – a magic Redwood tree blocking the exit. By re-arranging the magic letters from the boxes, the player can find the magic word, to aid escape.

Remember, the main points about the three types of problem are that they should be appropriate to the adventure, and solveable using the player's own resources.

Characters

Adding characters for the player to meet makes any adventure more realistic. Unfortunately, it also makes coding harder. The solution adopted here is to visit the *Acorn User* office/dungeon at night, when only Mad Alex is around. Apart from introducing the problems, he keeps a low profile.

Coding

Armed with our notes about plot, plan, routes, problems and characters we can start to assemble the adventure program. The first step in coding the adventure is to place all the scenes, room names, descriptions, routes and directions into the computer. Section 6 of the listing on yellow pages 103 gives all the information for the *Acorn User* adventure. Notice that we can still identify any room to check its information because of the way the data is laid out.

As adventures increase in complexity, so does the number of scenes. Data statements are usually converted into arrays, so the data of section 6 will occupy twice the space shown – once as the actual data statements, and the equivalent space again as the arrays are created. The alternatives to this use of space are:

- To access the data only from data statements, but this is slow and may not always be appropriate.
- To save the data as a file, and reload it at the start of each adventure. This is best done with discs.
- To load from disc each scene as it is required. This requires the use of random access filing techniques.

In our adventure, we create arrays

from the data statements, and use mode 7 to allow space in memory for the duplicated data. One easy way for you to start writing adventures is simply to replace the data with your own dungeon plan, room names, descriptions, routes and directions. The rest of the program will run quite happily with any data you give it, providing it is in the same form.

It is also best to include at this stage any other information the program will need. Particularly the numeric values for the number of: scenes (15); lines in


```
You are in                Air: 1200
the Back Issues Room.
Empty cabinets stand along
each wall - any sound echos
back and forth between them.

A corridor leads north.
A tunnel leads east.
A door opens to the south.

A box with a 10 sided lid
 lies  in a corner
What now? _
```

the room name and description (4); possible routes from each room (6); boxes for magic letters or air (10); initial amount of air (1200); rate of using the air per second (5); replenishment of air per box (100).

These are all found at the start of the data. The last item of data is the magic word which lets us escape the dungeon. I have used 'META', but this could be changed to any word up to nine letters long. Note there are 10 boxes and at least one must be reserved for air.

Select the magic word carefully. Words like XYPT or CTZCK are likely to cause frustration because the letters will be presented in any order, and the word must be constructed like an anagram. The letters making up META also make up MEAT, MATE and TEAM which makes the problem solvable. Imagine collecting the letters JGZXR and trying to work out that the magic word is GJRZX. If you were lucky it would take 16 goes. The magic word is the last item of data so it can be changed easily.

Instructions

There are four simple rules for instructions:

- Offer the player the option of reading the instructions.
- Make the instructions complete by including a 'how you have arrived' section, and by outlining the basic task.
- Show only a few lines of text at one time.
- Let players move through the instructions at their own rate.

In showing the instructions, we will

```
2750 DATA """Sneaked that bug
     into
2760 DATA "The commander
     Proggy,"""
2770 DATA chortles Alex.
2780 DATA " "
3130 DATA *,**
```

Figure 4. Beefing up DATA

have to deal with line lengths, blank lines, pages of information, quotation marks, commas and the eventual end of data. One approach is to handle as much as possible in the datalines themselves. Look at how the data statements in figure 4 handle some of the above problems. First, the length of any line of text is checked to be less than 38 characters (38 text + 2 control = mode 7 screen width). Commas in a line are handled by bracketing the line with quote marks (line 2760). Quotes are doubled up (start of line 2750 and end of line 2760). Blank lines are handled by a line containing a space enclosed by quotes (line 2780).

The end of page is marked by a '*' which is interpreted by the instructions

end of instructions and exits if this is the case.

PROCinstruct is self-contained, and so can be used in any adventure by changing lines 2220 to 2250, and altering the data statements. The markers * and ** must be used, and 'page length' should be no more than nine lines of text between *'s. Long instructions use up memory space, and advanced users might want to PRINT# the data lines to disc, and call them up with an amendment to PROCinstruct (figure 6).

The working adventure

Now that we have the data and instructions, we can start to code the working parts.

PROCsetup in listing section 4 takes the raw data presented in our dungeon plan and fits it into working arrays, ready for the player to interact with. This routine provides the major global variables for the program (figure 7). It is important to understand how the arrays are used. Figure 8 shows this. Although four lines of description are used they

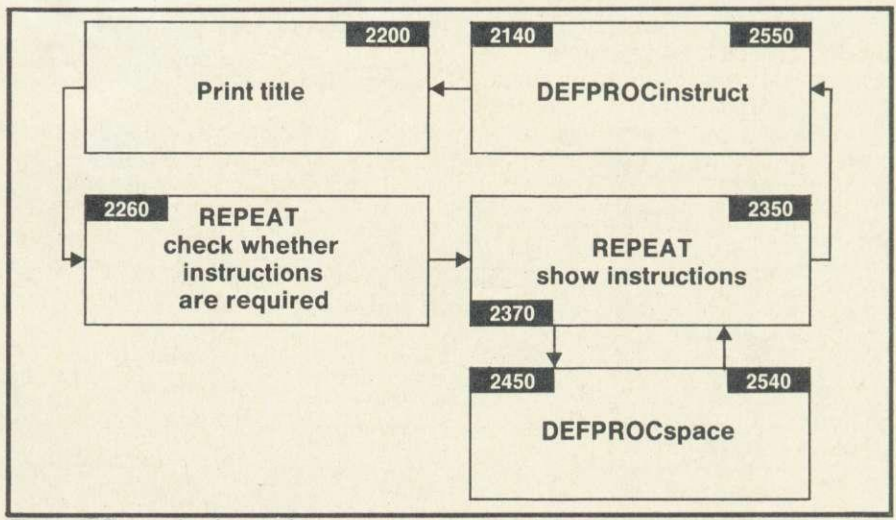


Figure 5. Presenting instructions

routine, and the end of instructions by ** (line 3130).

Most lines without commas, leading spaces or quotes, can be entered directly as in listing section 5. This includes the complete instructions for the adventure, along with the 'instruct' procedure for presenting them, and a routine for waiting until the space bar is pressed. Figure 5 shows the structure of this part of the adventure, which includes the guidelines presented previously. Readers will see that lines 2410 and 2420 are repeated because the instructions are in mode 7 double-height characters, set at line 2200. Of particular interest in the REPEAT . . . UNTIL structure starting at line 2350 are lines 2370 and 2380. Line 2370 checks for a page and waits for the space bar to be pressed. Line 2380 checks for the

map to array elements:

chamber$(room,0) . . . the room name
to chamber$(room,3)

the value of 'lines' is reduced by 1 in line 1850 to make this possible. Arrays are dimensioned at lines 1860-80.

The most complicated part of any adventure is handling the interaction between player and dungeon. In our program this is done by the 'play' procedure. This does the following:

- Name and describe room/scene.
- Describe the routes available.
- Describe any inhabitants/artifacts.
- Comment on any wasting in progress.
- Get the player's instruction.
- Interpret and act on it.

It is important to allocate space on the

screen to reflect each of these. Figure 9 shows how a screen might be organised, with important information displayed all the time. Our adventure uses this layout, and its main requirement is that the position of the scrolling window is recalculated for each room. Listing section 1 shows the main play procedure, and readers will notice that the points mentioned above relate to particular procedures: PROCdescroom; PROCdescexits; PROCdescboxes; PROCair; PROCgetaction; and PROCdoaction.

It is common to REPEAT the sequence PROCgetaction to PROCdoaction until the instruction is legal (lines 170 to 210 of PROCplay).

Before looking in detail at the procedures, it is worth noting that PROCplay must check whether the adventure is complete, or the player dead, after every action. This is done at line 260, where we check that the current room is the exit, or that the air has vanished. We could also check for death by heat exhaustion, being caught by a witch, or

```
2330 channel=OPENIN("instruct")
2360 INPUT#channel,text$
2380 IF text$="**" UNTIL TRUE:
     CLOSE#channel:ENDPROC
```

Figure 6. Possible change to PROCinstruct

running out of power pills. Because we are working in real time, lines 100 and 250 constantly check the air supply, altering it as time ticks away. If we're working with a wasting problem based on number of keyboard inputs or rooms visited we would have to use a statement like:

strength = strength–wastage

either at line 250, or in the PROCgetaction routine.

Dying

The most common approach to losing an adventure is for the player to die (and ours is no different). Readers might like to consider other punishments, particularly for younger children, where dungeon violence, death and permissiveness are not appropriate. A common 'fate worse than. . .' for children is being sent back to the start, so altering PROCdie to something like:

```
DEFPROCdie
CLS:PRINT''
PRINTf3$''you have run out of air''
PRINTf3$''you have run out of air''
PRINTf3$''you are sent back to the start''
PRINTf3$''you are sent back to the start''PROCspace
RUN
ENDPROC
```

will provide many children with more motivation than dying!

Each room visited has a number in the overall chamber$() array. If the data have been entered correctly, this number will be the number given to the matching room on the original plan. A variable is used to keep track of the current room, in this adventure called 'room'.

Listing section 3 gives the coding for the situation descriptions.

PROCdescroom is needed to name and describe the current room. Located at line 1580, it sends each line of the room description to PROCprint which then prints it in double-height characters. PROCprint is a little strange because it prints strings one character at a time (line 1700). This is done in case we want to encode the descriptions to stop players looking for answers in the listing.

Imagine that chamber$(12,3) contained the dataline: Uif tfdsfu uvoofm tsbsut ifsf (which we had previously coded). By altering line 1700 to contain a simple substitution code:

```
PRINTCHR$(ASC(MID$
  (tx$,loop,1) – 1))
```

the decoded message would be printed: 'The secret tunnel starts here.' It adds little to learning about writing adventures, so our demonstration is

```
You are in                Air: 788
the Finance Manager's Office.
Signs of great turbulence are
visible (including several
broken Piggy Banks).

A passage leads north.
A tunnel leads west.
A corridor leads east.

What now? _
```

not coded. However, the 'hook' of line 1700 allows this.

PROCdescexits is outlined in figure 11, and shown in listing section 3. Here, each of the six possible routes is taken in turn, until '@' is met (line 1400). Each route string is split into three parts: fst$, scnd$ and the final number (which is not used at this point). The whole of this procedure prints one sentence per valid route, expanding the single characters of fst$ and scnd$. For example, if fst$ = "C" and scnd$ = "D"

chamber$(room,line)				
room	Line 0	Line 1	Line 2	Line 3
0	-----	-----	-----	-----
1 15	Room name	First line of room desc.	Second line of room desc.	Third line of room desc.

route$(room,route)							
room	rt0	rt1	rt2	rt3	rt4	rt5	rt6
0	---	---	---	---	---	---	---
1	---	TE2	XX0	@	@	@	@
..... 15	---	etc	etc	etc	etc	etc	etc

box$(room)	
	box$(. . .)
0	– – – – – –
1 15	At random either: @ (= air) a single 'magic' letter or"" (empty)

Figure 8. How the arrays are used

we would see printed: 'A corridor leads down'.

This routine also handles the 'XX0' dead-end string and the 'EE0' exit string. Because we have previously checked on room 15 being the exit (line 260 of PROCplay) the 'EE0' handling of PROCdescexits is another hook, this time to use two or more exits. The simplest alteration to handle multiple exits would be by adding:

```
1475 IF fst$ = "E" END
```

PROCair is outlined in the structure diagram of figure 11 and shown in list-

time	delay time in 1/100ths seconds between rooms. Allows players to read the effect of any command typed before the screen clears.
f$,f1$ f2$,f3$	colour codes for start of text lines.
rooms	total number of rooms.
lines	total number of room description lines.
routes	total number of routes from each room.
boxes	total number of boxes.
air	start amount of air.
rate	air used per second.
extra	air provided by each box.
room	current room in the dungeon.
chamber$()	room description array.
route$()	route description array.
box$()	box description array.

Figure 7. Global variables

ing section 3 (lines 1100 to 1160). The routine simply displays the amount of air left, at the top right of the screen. It also sets up the scrolling command window for instruction entry.

PROCdescboxes (line 1770) is the first routine particular to this adventure. It describes any box in the current room. There are four situations to cover: no box in the room; box of air in the room; box with magic letter in the room; and opened box in the room. Let's examine each in turn.

If there is no box in the room, box $(room) contains nothing (""), so the procedure exits immediately with the Y-value of the scrolling window set.

Next, for a box of air in the room box $(room) contains '@', and line 1190 sets the box lid to have 10 sides.

Third is a box with a magic letter. Here, box$(room) contains a single letter from the magic word. Line 1200 chooses a randomly-shaped lid of 3,4,5,6,8, or 9 sides.

Finally, if there is an opened box box$(room) contains '0' (zero). The opened box is set to vanish by line 1210, and boxes are only visible for a short time after being opened. This prevents them re-appearing with extra air or letters after they have been used.

The FOR loop from line 1230 randomly positions the box in the room, and the procedure concludes by calculating the current Y-value of the text window as the current vertical text cursor position.

PROCgetaction is a short procedure (lines1050 to 1090), which allows entry of any length command line as an instruction. The scrolling text window means odd entries will not disturb the screen descriptions. The instruction entered is held for further processing in the global variable cm$.

The remainder of the program is often best customised to individual problems set when designing an adventure. The routines which follow describe moving between scenes, manipulating the boxes, and using the magic word to solve the final barrier. Handling extra problems is best done from PROCdoaction, so that a new command will perform a particular action.

Language

Some complex adventures allow the use of English phrases from which command words can be selected. In our adventure we will work with a very small subset of English. Our commands are limited to: NORTH, SOUTH, EAST, WEST, UP, DOWN and any number greater than zero. Look at DEF-PROCdoaction in listing section 2. Commands must be in capitals, although the lines between 420 and 470 could be amended to handle lower case letters, eg:

```
420 IF INSTR$(cm$,"north") PROC
   dir("N")
```

The INSTR function lets us decode complex command sentences such as 'Run north along the corridor,' but we cannot use: 'Shout 36' to open a box, because the way we test for box interaction is via VALcm$ of line 490.

PROCdoaction checks for movement in a direction using the keywords indicated previously. If movement is found, program flow is directed to PROCdir, taking the direction of travel as a parameter. Next, 'doaction' checks for the magic word. If this is spoken in room 13 PROCmagic is called to open the path to the staircase. If not, 'doaction' checks for a call to open a box, and if a number above zero is entered, the program diverts to PROCboxval. Each of these three procedures must set the global variable 'ok' to TRUE so PROC-doaction can detect that the action required was valid. If this is not the case the message 'Nothing happens' is printed and the program returns to PROCgetaction.

AIR: XXXX
You are in ROOM NAME DESCRIPTION LINE 1 DESCRIPTION LINE 2 DESCRIPTION LINE 3
Types of routes and directions
Random message about room contents
What next? Scrolling window for command entry

Figure 9. Organising the screen

PROCdir checks the routes from the current room with the direction letter passed to it as a parameter. If there is a match, the number part of the direction string (route$(room, route)) is fed into the global variable 'room' so that next time around the main loop, the scene will move to the next room. For example, if in room 6 we decide to go east, PROCdir will compare the 'E' of EAST with the string 'DE7' in its route array. Because the E matches D(E)7 we are directed into room 7 – DE(7). If there is no match, for example by trying to go north in a room with no north exit, the message 'You can't go that way' is printed. If 'dir' is called, it will always return 'ok' as TRUE, because it will have handled all the alternatives itself.

PROCmagic is only called when the magic word is spoken in the correct room. Rather than have more coding, I decided to rewrite the description of room 13, and remove the programming barrier to escape. Lines 540 to 560 are self-explanatory, but 570 needs explanation. Initially route$(13,2) contains the code 'SU13' (see figure 2, room 13). This means that going up from room 13 is legal, but returns us to room 13. The player puts this down to the Redwood tree, and by speaking the magic word the barrier is removed. In actual fact the connection between room 13 and 15 is remade correctly.

```
You are in                Air: 774
Kitty's Corner.
Etched into the imitation
chipboard are the cryptic
words 'Kitty luvs ......

A passage leads east.
A corridor leads south.

A box with a 10 sided lid
lies  in a corner
What now? GO EAST_
```

In PROCboxval action is taken if a number is entered as a command. Line 640 checks if a box exists; if not, it exits. If one exists, line 650 checks the number entered against the equation for the box. At present this formula is 360/sides or the value of an external angle of the current box lid. For example, the 10-sided box is opened with a value of 360/10=36 while a 3-sided box is opened with a value of 360/3=120. To make the opening numbers different, change the formula to:

IF VALcm$ < > 180 – (360/s) . . .
(internal angles)

or

IF VALcm$ < > s*s. . .(square of the sides)

If this equation is not satisfied by the number input, PROCvanish erases the content of box$(room) and recreates it in an empty room.

Line 670 handles the opening of an airbox, using PROCairmess (line 730 on). Here, the extra air rushes out and is added to the total air, by line 760. The box then vanishes, so as not to clutter the adventure. Lines 680 onward handle the opening of a 'letter' box and its subsequent vanishing.

Playing the game

Having worked though the program, play the adventure, and compare its action with these notes. This will improve your understanding of how the coding causes things to happen. The next stage is to alter the instructions and data and play again. Check that all goes as planned. Finally, alter the method of wasting away from loss of air to, say, falling temperature. If you can make changes, the next step is to produce your own adventure. Go on, have a try. After all, nothing ventured. . .

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- Powerful Zoom And Pan
- Scale Drawing & Text
- Graphic Library Index

These advanced features represent a significant step forward from the existing and very successful Bitstik Graphics System. Yet Bitstik 1 users can obtain Bitstik 2 at a Special Upgrade Price.

Bitstik 2 is produced in the UK by Robocom, the people behind the best-selling Robosystem family of CAD packages for the Apple II (+ or e) micro. To run Bitstik 2 you will need a BBC Model B with 6502 Secondary Processor, Twin Disk Drives and colour or monochrome monitor. Quality hard copy can be produced from a wide range of supported plotters.

So whether you need to produce complex architectural plans, detailed circuit diagrams or simply teach CAD on a fully implemented CAD set-up (with scope for advanced project work) you ought to be tuning into Bitstik 2 for your BBC...

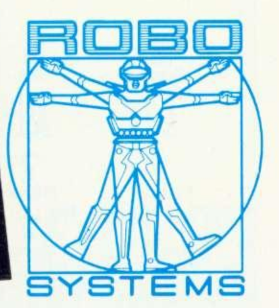
Hotline Support

What's more, with Robo, advice doesn't stop when you've purchased a system. A small yearly subscription ensures that lifting your phone puts you in touch with expert help on any drawing or technical problem.

Test draw a Bitstik

See for yourself how the Bitstik 2 system can make your drafting projects easier. Just try it out, with no obligation to buy. Ask your local Robocad Centre for details of our free Test Draw a Bitstik Offer.

DIAL 100 AND ASK THE OPERATOR FOR FREEPHONE ROBO. WE'LL PUT YOU DIRECTLY IN TOUCH WITH YOUR LOCAL ROBOCAD CENTRE.



Robocom, Clifton House, Clifton Terrace, London N4 3TB.
Telephone 01-263 8585/272 8417. Telex 297137 ROBO G

AMX MOUSE

Catch an incredible AMX MOUSE! The advanced opto-mechanical device that brings to your BBC micro facilities once only available on more expensive computers. Now you can use ICONS, WINDOWS AND POINTERS in your own programs.

AMX PACKAGE

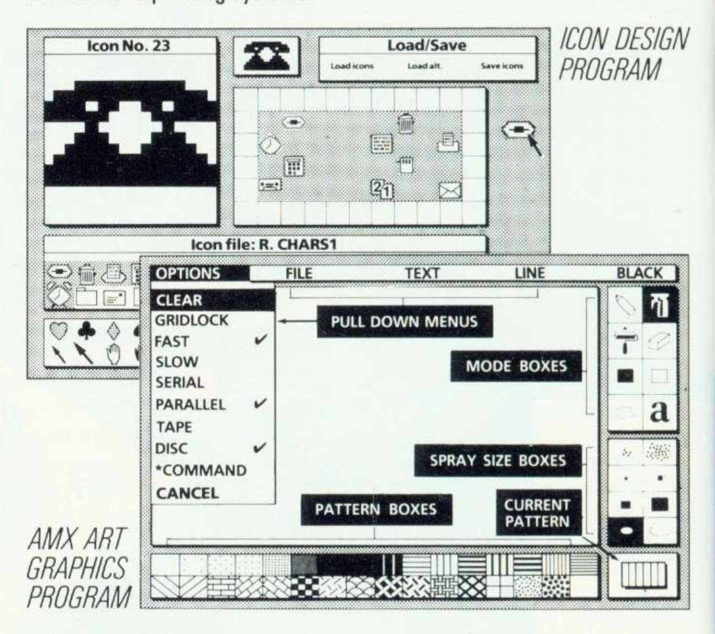
Plug the MOUSE into the user port, and the EPROM into your board. The latter contains fast machine code routines for creating on-screen windows, icons and pointers. And means that the MOUSE buttons can be progammed for use with commercial software such as Wordwise and View. There are two manuals included, explaining how to operate the MOUSE and the ROM routines, which are available in both basic and machine code programs.

Included in the package are two superb programs:

AMX ART has to be seen to be believed! It's a computer-aided drawing program that's just as good for serious applications–such as the preparation of detailed architectural and engineering drawings or teachers' worksheets–as it is for having lots of family fun! And if you're artistically inclined, you'll be astonished at the quality of work you can produce and save. It makes full use of on-screen menus, pull-down menus and icons: the ideal, easy way for novices to learn and gain in confidence.

ICON DESIGNER is an invaluable program for creating and storing icons for use in your OWN programs.

The AMX MOUSE may be used with any BBC Model B fitted with the Operating System 1.2; and it's compatible with the 6502 second processor and disc or tape filing systems.



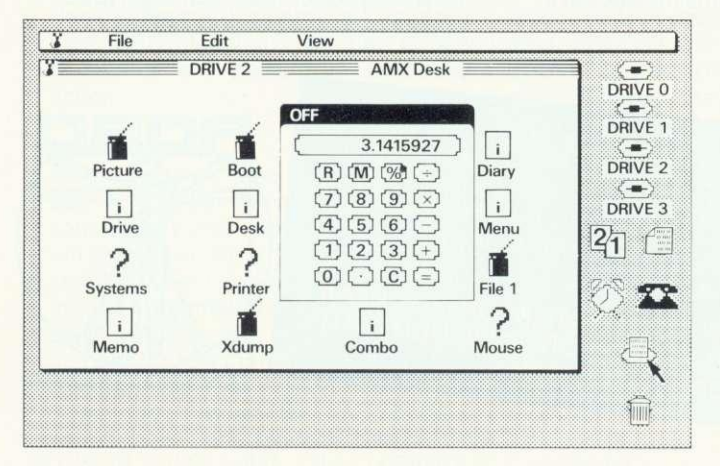
New! AMX DESK

DISC ONLY £24.95 INC VAT

A terrific new program designed for the AMX MOUSE. If you want to get properly organised–at home or at work–DESK is for you!

The main screen contains a desktop with header offering SYSTEM, FILE and EDIT menus–plus an additional menu for extra features; and there's a constant time display.
Down the right-hand side are icons displaying Disc Drives, Memo Pad, Telephone Book, Diary, Alarm Clock, Printer and Trash Can. Simply by using your MOUSE you can select any service you require.

- MEMO PAD–Up to three pages of text may be stored. With printing at the touch of a button.
- TELEPHONE/ADDRESS BOOK–Up to 200 or 400 entries (depending on disc drive capacity) with handy scrolling search.
- DIARY–Displays a calendar for three months, centred on the current month, with scrolling backwards and forwards. Dates with entries are highlighted; select a date and view the entries.
- ALARM–Sounds at the time you've pre-set, whichever DESK service you're using.
- CALCULATOR–A full-function calculator can be brought on-screen at any time, and results can be stored for use in Memo Pad, etc.



Any window showing Telephone/Address Book, Diary or Memo Pad may be dumped to the printer by simply selecting the printer icon.
An interface program for Wordwise + and View means pictures created with AMX ART can be merged with text upon printing out.

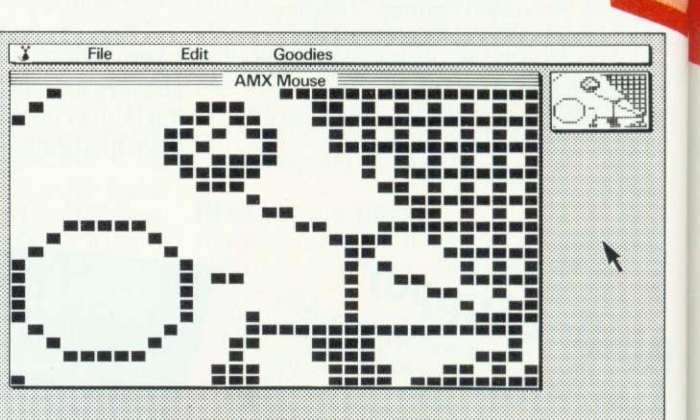
New! AMX UTILITIES

DISC ONLY £14.95 INC VAT

Another remarkable new program for the AMX MOUSE. Now you can enjoy many drawing features you'd never expect to find at this price!

The Zoom facility means easy and accurate amendments to your drawings: one dot becomes a character. You can copy, rotate and reflect; enhance circles; draw ellipses and arcs; and print icons, too. Borders can be added, and pictures can be stripped and centred ready for saving and printing.
There's colour sketch, too...
Great for budding artists!

All disc software is available on 40 or 80 Track and 3" disc. Please state which you require when ordering.



These exciting AMX products are available from top computer dealers. Or you can order direct from us. Send cheque/PO to Advanced Memory Systems Ltd, Green Lane, Appleton, Warrington WA4 5NG. Ring (0925) 62907)602690 for instant ACCESS and VISA orders.

See us on **Mouse Links** on Viewfax tube link on Prestel: **Page No. *258216#**

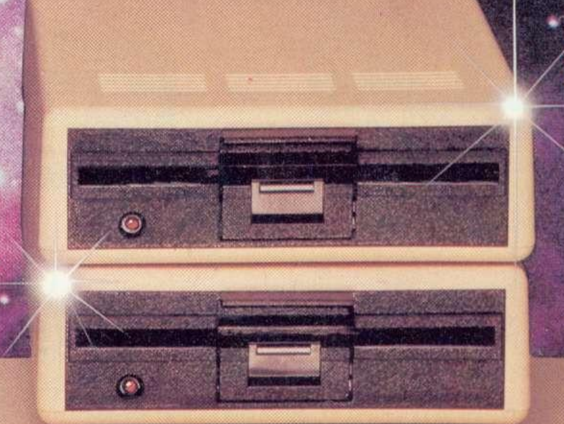
SPACE ... WAS THE FINAL FRONTIER

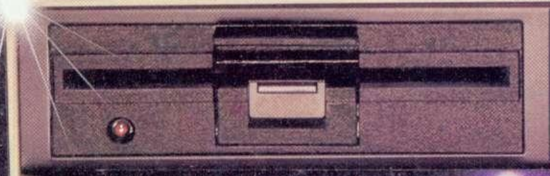


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MD402D
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The Association of Teachers of Mathematics

present

"L" — A Mathemagical Adventure

This program was number 10 in Educational Computing's Top Twenty programs of 1984!

Educational Computing said: "The children who adventured through "L" had a great time. It is appealing and addictive, and it really makes them think."

Times Educational Supplement said: "A shining example."



Alice of Micro User said: "I liked it!"

"L" is an adventure that requires mathematical activity. The format is familiar to adventurers but there is no violence — just plenty of problems to solve.

"L" costs £10 and is available on a 40 track disk for BBC Model B microcomputer (postage free) from:

**Department AUY, ATM,
Kings Chambers, Queen Street,
Derby, DE1 3DA.**

A SIDEWAYS GLANCE AT DISC UTILITIES

Richard Harris plays it safe with half a dozen more routines, this time for manipulation of data on disc

THESE disc utilities add easily to last month's listing, if typed in exactly as given. Note that three lines do not follow the normal step of ten; these are additions to last month's listing.

The easiest way to add them is to type this month's listing in as a separate program, save it, and then *SPOOL a listing. This can then be *EXECed into the original program.

Apart from the actual disc routines I'll also deal with errors occurring within a utility ROM. The usual BBC micro method to handle errors is to perform a BRK opcode. Language ROMs should have a routine to cope with these errors; normally they expect an error number and error message to follow the BRK opcode. Unfortunately if the error is in another paged ROM, the language ROM will not be able to read this data directly since it itself is now the selected paged ROM. The simplest solution for utility ROMs is to put the necessary data into main memory, so that any ROM can utilise it. The safest area is at the bottom of the stack, ie, &100 upwards.

This is the technique used by this program. A slight snag is that different language ROMs handle error messages slightly differently. The ones given are designed to provide the correct display from Basic 2. *Wordwise Plus*, for instance, corrupts some of the messages by suppressing line-feeds; the purpose of the message, however, remains clear.

The first utility allows safe DFS operations which normally corrupt main memory. The DFS uses memory between PAGE and HIMEM as a buffer during *COPY, *COMPACT, *BACKUP and *BUILD. If a command is prefixed with X, eg, *XCOMPACT, then PAGE is temporarily changed to 8k below HIMEM (less if normally less than 8k, for example when in mode 0).

See next month's issue for coverage of extended help messages, ROM utilities and adding your own routines

Next, all data between PAGE and HIMEM is shifted into the sideways RAM. Then the command (minus the X) is offered to the paged ROMs using *FX 143 (OSBYTE &8F). The command also has to be offered to the current filing system using OSFSC: the DFS does not recognise all of its commands via the paged ROM facility but uses OSFSC routines. These calls are indirected through &21E. The relevant one is with A=3, 'unrecognised command'; X and Y point to the command. This can be shown in two ways; after *TAPE some DFS commands still work, eg, *DUMP. Second, if the OS is fooled into thinking that there's no DFS ROM after selecting *DISC (by putting 0 in the ROM type table at &2A1), *HELP will show no DFS, yet some commands still work, eg, *COPY.

Lastly, the data is returned to main memory from paged RAM. Errors or the Escape key will prevent normal return to this routine, since they will occur in the DFS ROM, so service entry with A=6 is then used to restore the main memory. Since this routine uses the same sideways RAM memory as the printer buffer, an error is generated if the buffer is active.

The next two routines involve formatting, again without corrupting any memory. "*FORMAT d t" will format and verify a disc after a warning message – d is drive 0-3, and t is the number of tracks; 3=35, 4=40, 8=80. "*VERIFY d" just verifies the disc; the number of tracks is displayed, as well as whether the disc is split (see below). Any faulty tracks are indicated.

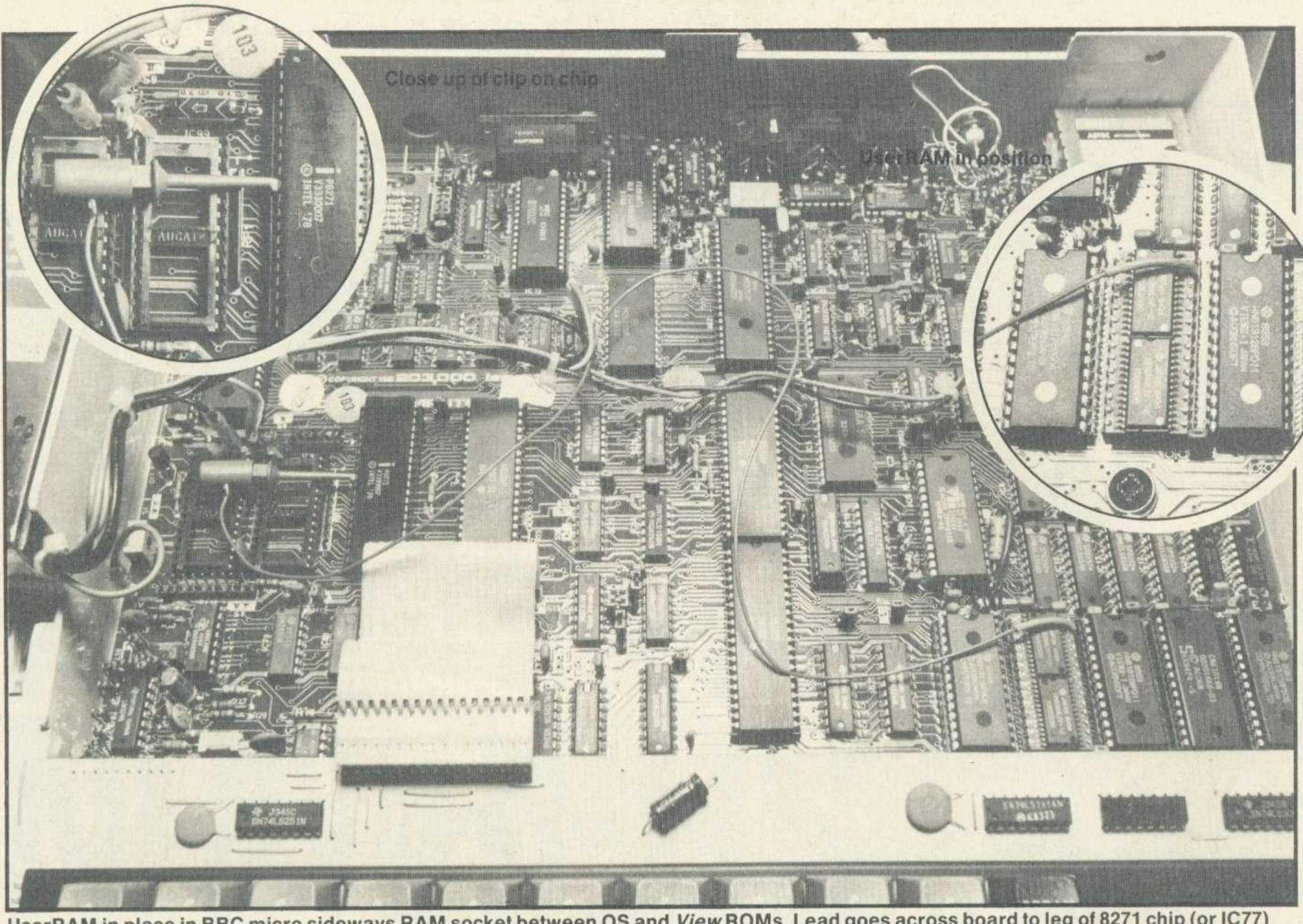
The last three routines allow 60 files to be saved on a disc, and are compatible with the Viglen system. "*SPLIT d" creates a second catalogue which is saved on the middle track. "*SWAP d" swaps between the two without affecting programs in memory.

The number of available sectors in the original catalogue is halved, so that no data will be written to the second half of the disc. The second catalogue has a dummy file (appears as ......) which covers the first half of the disc. As long as this dummy file is left alone, the first half of the disc will not be written to. "*INV d" displays both catalogues in paged mode.

*BACKUP will not work correctly if the current catalogue is the first one: only half the disc will be copied. Always use *SWAP to ensure that the second catalogue (ie, the one with the dummy file) is current before using *BACKUP (or *XBACKUP).

Various errors will be reported. *SWAP will not swap a disc that is not split, likewise *INV. *SPLIT will split a disc that already has some files on it, but only after giving a warning; it will be safe as long as less than half the disc is currently used. It will not split a disc that is already split.

The listing for these disc utilities is on yellow pages 104–106



UserRAM in place in BBC micro sideways RAM socket between OS and *View* ROMs. Lead goes across board to leg of 8271 chip (or IC77)

FIRST EASY-FIT SIDEWAYS RAM

● 16k ● Fully-compatible with BBC B/B+ ● Backed by *Acorn User* ● 3 minutes to fit ● Software support ● Comprehensive manual ● Disc or cassette ● Ideal for schools ● Works on Econet ● No soldering ● No chips to remove ● No cutting tracks ● Only one lead to fit

TAKE a piece of software, load it in UserRAM using the utilities provided and it can be accessed instantly using a '*' command or run as a Basic program: no waiting for the disc or cassette. It's just like using software on a chip such as *Wordwise* or *View*.

The *Acorn User* UserRAM is as easy to install as a sideways ROM, with just one lead to clip onto the leg of a chip (there's a choice of two) – there's no need to unplug the chip to fit the lead. It takes three minutes to do – and two of those are taken up removing and replacing the BBC's lid! This has been made possible by fitting two of the latest 8k RAM chips onto a circuit the size of a standard 16k EPROM or ROM.

A comprehensive printed manual gives fitting instructions, information on how to create your own sideways RAM software, ideas on using the equipment and technical notes on how the utilities provided work. Also, a standard disc (which runs on 40 and 80 track drives with any DFS and is unprotected) is supplied with all the basic utilities needed. One year's guarantee is given, with postage and VAT included.

Write to *Acorn User* for details of multiple orders.

SO EASY TO FIT

1. Switch off BBC micro. Remove lid and keyboard to reveal sideways ROM sockets.
2. Insert UserRAM into any empty sideways ROM socket, just like a normal chip.
3. Take lead over to left of BBC board and clip to leg of a chip (does not have to be soldered, or chip removed).
4. Replace keyboard and lid.
5. That's it! You're ready to check the installation with the software supplied.

Pack 1 £45.50

- **16k sideways RAM chip with attached connecting lead.**
- **Disc of utility software.**
- **Instruction booklet.**

Copyright notice:
No party connected with this product will give aid to anyone seeking to break software copyright. *Acorn User* welcomes details from software houses willing to license schools and other users of UserRAM for their products.

Pack 2 £62

- **As in pack 1, plus**
- **22 new utilities including printer buffer, *FORMAT and VERIFY for discs, ROM auto boot, two OS calls, save graphics screen, list function keys, and much more.**
- **BBC Micro ROM Book by Bruce Smith (published by Collins at £9.95).**

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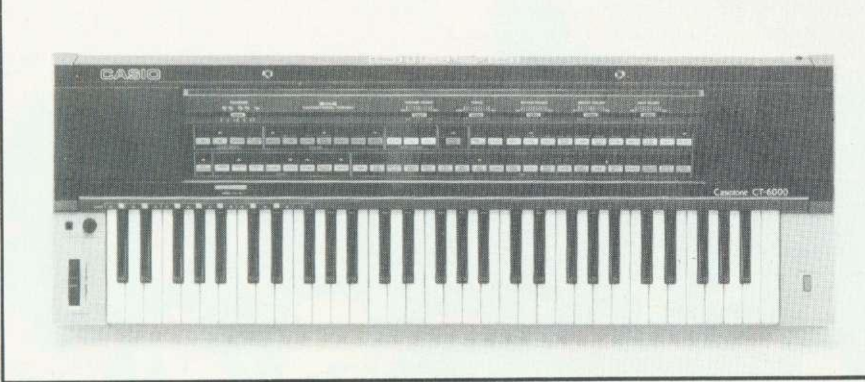
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Sophisticated: our first prize of a Casio 6000 music keyboard worth £695





MIDITRACK software (top) and MIDI interface (above) bring music to the micro.

ALL THE NUMBERS

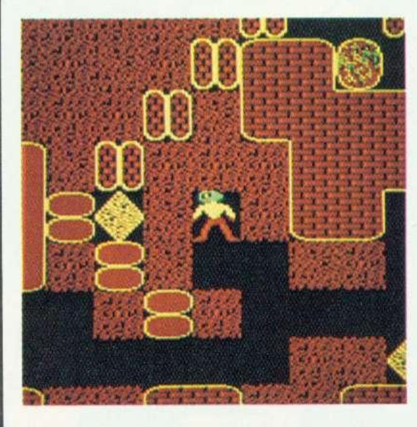
Win a £850 music system in Simon Dally's third anniversary quiz

OUR third anniversary competition concerns the digits 1 to 9. You have to find all the nine-digit numbers containing each digit once, and once only, which can be generated by multiplying five numbers together which in turn contain all the nine digits once and once only. To give an example:

4 × 6 × 8 × 93 × 7251 = 129,473,856

There are eight other numbers which can be generated in this fashion (assuming base 10 arithmetic and positive integers only). When you've found them, add them to the example above and send the result on the back of a postcard or envelope to July Competition, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH, to arrive not later than 2 August.

The £850 first prize this month is the Casio 6000 music keyboard worth £695 plus a MIDI interface and MIDITRACK composer software together costing £159. The software (available on disc or cassette) allows you to put together a note-perfect composition from a simple tune to a full ensemble score.


Repton: Superior Software's new game for 50 runners-up

For the 50 runners-up we've got copies of the new Superior Software game, *Repton*, available in both BBC micro and Electron versions, so please state which you own on your entry.

Your mission in *Repton* is to retrieve diamonds from underground caves riddled with dangers such as giant eggs which hatch into reptiles. It features four-way screen-scrolling over an area 16 times the size of the screen, with 12 levels of difficulty.

March winners

OUR March competition ('Keep on Trucking') produced some 900 entries, only about 25 per cent correct (well, it was a toughie). The three routes you have to take to fulfil the conditions cover a total of 1649 miles and are:

1) Birmingham-Manchester-Leeds-Newcastle-Edinburgh-Blackpool-Liverpool-Birmingham = 674 miles.
2) Birmingham-Bristol-Cardiff-Swansea-Birmingham = 301 miles.
3) Birmingham-Coventry-Ipswich-London-Portsmouth-Southampton-Plymouth-Birmingham = 674 miles.

The four winners of *Wordwise Plus*, picked out of the hat, were Roger Desforges of Formby, Liverpool; Miss K Pooley of Cheam, Surrey; the Page family of Beaworthy, Devon and an anonymous entrant of Winchester.

When you enter *Acorn User* competitions, do remember to include your name and address. Anonymous and address-less entries are money to the Post Office with no hope of reward! Also, please do not include letters about other subjects: competition entries go into a special box and your queries will be at worst unnoticed and at best delayed by a month before anyone looks at them.



The UMI-2B multi-MIDI system is one of the most sophisticated options on the market

MIDI-TATION

Jay Chapman's overture on musical instrument interfaces inspires tuneful Beeb expansion

MICROS have now come together with musical electronics to open up music playing and writing to all. And it's not just in the home that the new approach is being adopted – professional musicians are using micros to compose, edit and play too.

Musical keyboards began to carry their own tiny, built-in computer-type intelligence some years ago, but a micro such as the BBC is capable of doing much more, while its built-in sound chip is, in musical terms, very limited. So all it needed was to connect the two: the micro's brain and the musician's familiar hardware. Then along came MIDI (Musical Instrument Digital Interface), a small device that simply passes information between the two.

This article is not a product review, but aims to give a general idea of what's possible. The list of addresses includes all the relevant computer music products I'm aware of. This is a very young area and new products, as well as more sophisticated versions of earlier ones, are rapidly becoming available, so it may well be worth contacting as many sources as possible to get the latest on what's happening. If you want to add a keyboard to your Beeb the cheapest is the Casio CZ101 at around £300, while the most sophisticated is the Yamaha DX7, which is in the £1400 range.

MIDI

Recently, the micro revolution has entered the music field with a vengeance. Electronic synthesisers have moved on rapidly from being purely analogue devices. Both the control and generation of sound used to rely on analogue electronics, but digital techniques have improved the accuracy and repeatability of control. Also, the new technology encompasses the science of digital recording (sampling) and creating sounds which, since they are turned into mere strings of numbers, can easily be manipulated.

With the arrival of digital control, manufacturers realised that synthesisers could not only be controlled by other synthesisers but also by a micro with a standard hardware interface. The potential is considerable because a micro is far more flexible than the dedicated, stand-alone sequencers and controllers produced in the past. In fact the better the design of the software for the micro, the better the micro/MIDI controller becomes.

Top row KX1203, K12SV3, KX1201. Bottom row K12R3, K12R2. Optional 'tilt and swivel' stand shown with certain models.

Aim straight for a Taxan

When you're aiming for the best monitor around, set your sights on a Taxan.

Because Taxan are quite simply the biggest selling range of monochrome and colour monitors in Britain today.

And that's hardly surprising since every Taxan Monitor is designed and engineered for superb style and maximum performance.

Take a look at the KX1201 and KX1202 for example.

High quality, high resolution 12 inch monitors offering a choice of Green or Amber display with a long persistenceoption on the Green phosphor model.

With the latest non-glare flat tube for easier viewing and more than 20MHz video bandwidth, you' can't do better than a Taxan monochrome monitor.

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Like the medium resolution K12R2 (Vision II) and the high resolution K12R3 (Vision III).

Compact professional monitors, suitable for all popular micros. Built-in switchable RGB interface for added versatility and both suitable for 80-column text display.

Finally, the K12SV3 (Super Vision III). A 12 inch, RGB, super-high resolution, colour monitor with three different monochrome modes. Fully compatible with IBM PC, Apple, BBC and most other personal computers it is simply the most versatile monitor on the market today.

Taxan Monitors retail at around:

KX1201G	£109 (plus VAT)
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KX1203A	£119 (plus VAT)
K12R2	£285 (plus VAT)
K12R3	£399 (plus VAT)
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MIDI Consultant
Hinton Instruments, 168 Abingdon Road, Oxford OX1 4RA. Tel: 0865 721731.

UMI2B
MIDI interface/software
Umusic, 17 Parkfields, London SW15
or
The London Rockshop, 26 Chalk Farm Road, London NW1. Tel: 01-267 5381

BeeBMIDI_1 interface PCB and construction details
(also articles on MIDI hardware and software)
Electronics & Music Maker, Music Maker Publications, Alexander House, 1 Milton Road, Cambridge, CB4 1UY. Tel: (0223) 313722

BeeBMIDI_2 interface and Software
MIDI Consultant
Jay Chapman, 23 Malvern Drive, Leven Banks, Stokesley, Middlesbrough, Cleveland TS9 5NS. Tel: (0642) 712085

MIDI interface and MIDITrack software
MIDI Consultant
Electromusic Research, 14 Mount Close, Wickford, Essex SS11 8HG. Tel: (0702) 335747

Roland MPU401 intelligent
MIDI interface and software
Roland (UK), Great West Trading Estate, 983 Great West Road, Brentford, Middlesex TW8 9DN. Tel: 01-568 4578

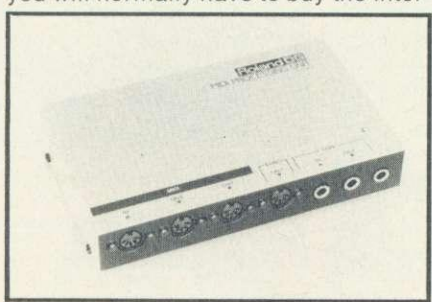
MIDI Controlled Sampler 1
Powertran Cybernetics, Portway Industrial Estate, Andover, Hants SP10 3EM. Tel: (0264) 64455

Clef Computer Music System
Clef Products (Electronics), 44A Bramhall Lane South, Bramhall, Cheshire SK7 1AH. Tel: 061-439 3297

Acorn Music 500
AMPLE Music Programming Language
Acorn, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL. Tel: (0933) 79300. (See review by Ultravox in June's *Acorn User*)

Hardware

MIDI hardware and software is available from the first six suppliers in my chart. The interface needed to drive MIDI is essentially a fast serial data link, similar in some respects to the RS423 port. It is isolated to avoid hum loops. This is handled by the 6850 interface control chip on the BBC micro's 1MHz bus. Unfortunately, there is no standard for addressing this chip, so you will normally have to buy the interface from the same vendor as the software. You should expect to pay around £90 for a MIDI. An alternative, which will also interface to any other micro having an RS232 (or equivalent) port, is available from Hinton Instruments.


Roland's MPU 401

The simplest interfaces will have just one MIDI IN to receive control information from one synthesiser, and one MIDI OUT to transmit control information to several synthesisers. They are connected together daisy-chain fashion, and all listen in for 'their' data. Because of timing problems caused by the daisy-chain connection, it's useful to have two or three MIDI OUTs on your interface so synthesisers can be connected directly.

More sophisticated interfaces may have various 'sync in' and 'sync out' facilities to connect to non-MIDI sequencers and drum machines. If you need to synchronise with a tape recorder look out for a TAPE FSK connector. If you have non-MIDI synths you might consider the availability of CV (pitch control voltage) and trigger outputs as an important advantage.

Software

The two most important features of MIDI software are sequencing and editing. The latter gives you the ability to enter and correct musical passages which are then played in various sequences and combinations of sequences to build up a song. In this way the budding composer who feels limited by his lack of playing technique can concentrate on composition yet still control, in every detail, the quality and accuracy of performance.

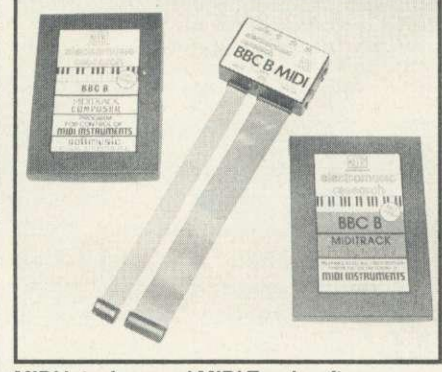
In addition to the step-time form of input/editing, where each note's details are laboriously entered more or less in turn, some software allows the user to input musical passages by actually playing them in real-time. Unlike a tape recorder, however, the piece can be played in with real-time 'slowed down' to accommodate slow-moving fingers during recording and then set back to proper real-time(!), without a change in pitch, for performance.

The best software allows the user to record on many (often 16) fully polyphonic tracks with a variety of instruments being controlled simultaneously – rather like a multi-track digital tape recorder. Editing should preferably use some form of graphics, probably relating to musical notation, and so be 'user friendly'. Software which expects the user to enter numbers for the pitch, length of note, loudness, etc, is painful to use and should disappear fairly soon. At the other end of the quality scale it's possible to play (in real time) a piece of music via an instrument keyboard which is then reproduced on staves in correct musical notation by a dot matrix printer!

Sampling and synthesis

Not all the BBC micro compatible products are used just for controlling the 'playing' of synthesisers. It's possible to 'sample' (make a digital recording of a sound and, by manipulating the set of numbers representing the noise, have that sound available across a five-octave keyboard.

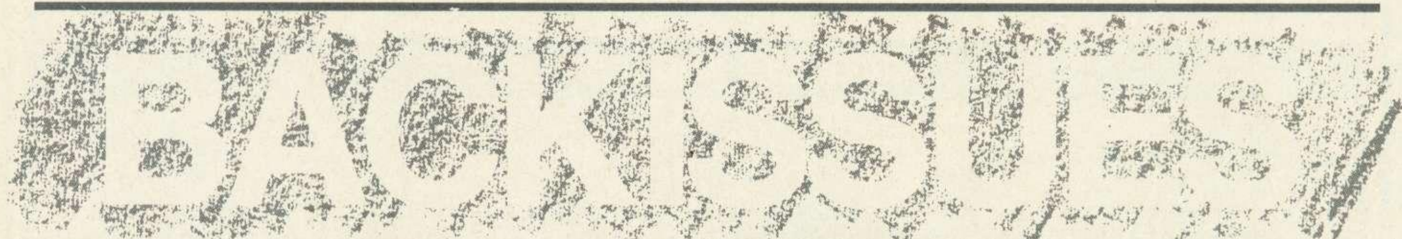
A different approach is to use the number-crunching power of the BBC micro to construct a sound by adding and subtracting numbers corresponding to the harmonics of a sound to control its timbre. The complexity of the facilities made available by a combination of specialised 'add on' hardware



MIDI interface and MIDI Track software

and clever software is far greater than analogue synths can offer.

If you're a musician – or a would-be composer who never quite found the time to learn to play an instrument – you would be well advised to follow up this brief introduction to the fascinating potential offered by the BBC micro in the world of digital music.

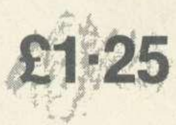


1. July/August 1982 The first issue. Articles on drawing techniques. The BBC Computer Programme. Machine code graphics. Questions & answers. Hints and Tips. Sound. Interfacing scientific instruments. Dumb Terminals for 0.1 machines. Disc drives. Econet in schools.

2. September Ceefax telesoftware. Beeb in business. Mailing list. Simple files. 30-Hour Basic course. Art on a micro. Music. BBC micro as a keyboard. Extra Atom commands. BBC Basic board. ULA design. Teletext graphics. Machine code graphics. Analogue input. Schools training. 0.1 cassette bug patch.

3. October Electron details. BBC TV series – confessions. Two Epson graphics dumps. Seikosha GP100 dump. Worldwide networking for BBC micro. Garbage handling. Voice ROMs. Sound pitch envelope. Moving graphics. ZX printer for Atom. RGB colour separations for Atom. Biofeedback. Book reviews.

4. November Teletext. Second BBC TV series. Machine code series 1. Programming forum. *Trek III*. Speeding up graphics. Bomber game listing. 7-tone Epson graphics dump. Atom graphics manipulation. Dumb terminal for 0.1 machine. Firework graphics. Editing tips.



5. December BBC TV in schools. Machine code 2 – registers. Programming forum. Program generators. Carols. Hints & Tips. Logo and Turtle graphics in schools. Introduction to procedures. Software review. Atom word processing. Toolbox review. 16-colour graphics on model A. Sorting. Sound envelope design.

6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.

7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1).

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2).



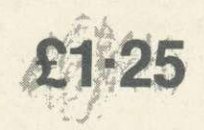
9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3).

10. May Review of Basic II(1). Graphics listings(1). New *FX calls in OS1.2(1). Colour mixing on the Beeb(4). Jazz, blues and folk on the BBC(6). Schools 5 – language development(6). DIY Beeb interface box(4). Atom sound board(5). A to Z of printing: how to get going(4). Hints and Tips: PROCs, discs and FNs(5). Printer, software and book reviews.

11. June Techniques series – sorting(2). Hints and Tips: 50p network(5). Drawing techniques and CAD(5). Machine code: interrupts(6). Schools 6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps(4). Comparative review of *View* and *Wordwise*(3). Three graphics packages reviewed(3). Test of *Acorn User*'s interface box(4).

12. July Techniques – hash tables(2). Hints and Tips: logic made easy(5). Recursion and graphics(6). Handling strings(3). Two ideas for passing variables(2). Beeb aids the blind(2). DIY second keyboard(5). Beeb Forum. Sounds on the Atom(2). Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps(2). Techniques – Tree structures and sorting(2). All the fun of the fair(7). 40/80 disc copier(2). Colour painting(5). Basic II: random access files(2). Screen dumps for Olivetti, Centronics and Seikosha(5). Atom strings(3). Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

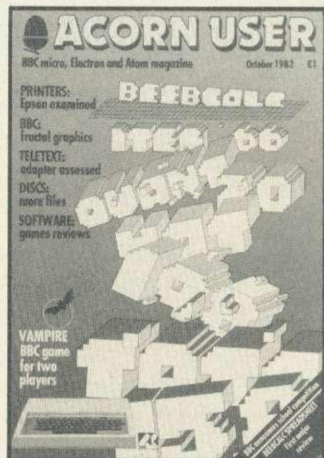


14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega*



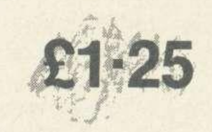
Monsters game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*.



Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler utilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



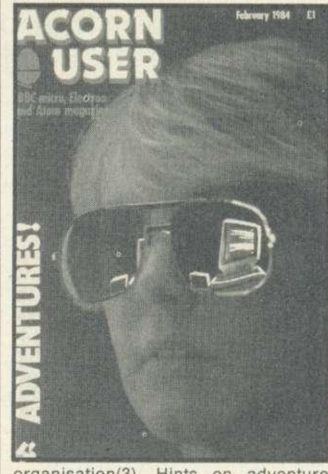
17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.

18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure.



Reviews of utilities, software, *Beeline* wordprocessor, educational packages, two chess programs.

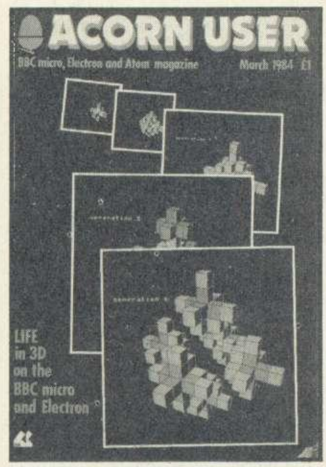
19. February: Adventures special issue Techniques – efficient sorts(3). PROC for a numeric keypad on the Beeb keyboard(1). 12 graphics listings(1). Random access filing on disc(5). Locking files(2). MCP40 printer/plotter looked at(5). Hints & Tips(3). Beeb Forum(2). Make discs readable on 40 and 80 track drives(4). Screen memory



organisation(3). Hints on adventure design(3). Adventure action(4). Adventure ideas in computer language(2). Text compression(2). Word-crunch-

ing(4). VIA chip on Electron to drive a parallel printer(3). Atom Forum(2). Schools – simulation packages(4). Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp



1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV(3). 6845 chip explored(3). Advanced filing systems(1). Lisp 2(4). Hints & Tips(3). Beeb Forum(4). Choose disc tracks to copy(4). Function key editing(4). Teletext dumps(3). CES scrutinised(3). Passing variables(2). Computer Concepts' graphics ROM(4). Schools – simulations(4). Calculating Easter dates(3). Better programming(3). Atom Forum(2). Atom ROM routines(5). Converting BBC to Atom Basic(2). Three printers compared(2). Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.



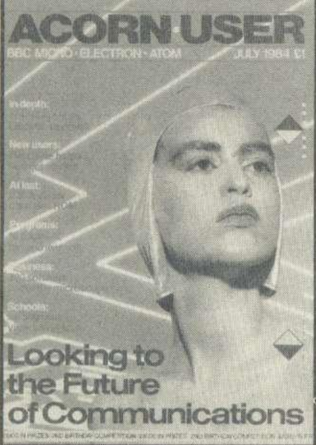
22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand



disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.

23. June Acorn Z80 second processor(3). Forth(2). Graphics to brighten up your games(2). Soft Pottery graphics(4). Go faster and save memory space(3). Rapid search and load routine for tapes(2). How the Beeb and Electron work 1(3). Business: reviews and how to gently enter office computerisation(4). Education – adult literacy(3). Dumping Atom programs on the BBC(2). Atom Forum. Software copyright laws(2). Hints & Tips(4). Techniques – B-Trees(3). Beeb Forum(2). Reviews of monitors, printers, books, software, adventures, EPROM programmer.

24. July Communications: the future; portable micros; modems & electronic mail. Hints & Tips. First Byte: using your micro. Beeb Forum on Basic. How it works II: slow down the Beeb. Business: Acorn's Z80 software, Starbase ROM. Education: a look at Edfax, how to teach facts. Atom Forum. Converting BBC to Atom Basic. Reviews:



Electron Plus-1, Solidisk's 128k RAM board, three IEEE interfaces, Canon colour and Brother printers, ADE ROM.

25. August Downloading the weather. Teaching tots: keyboard overlays, activity board. First Byte: writing & debugging programs. Hints & Tips. Beeb Forum: 6502 second processor & Tube tips. How it works III: random numbers. Business: Plan software for Z80. Atom Forum, avoiding errors. Reviews: 3 drawing packs, Torch Unicomm, MCP's Interbeeb, software plus for Micronet.

26. September Decoding radio signals, First Byte: getting moving. Hints & Tips.



Education: problem solving. Sprite design and animation part I. Beeb Forum: fastest dump. Write your own disc formatter. How it works IV: random number generator. Business: Nucleus software for Z80, accounts. Atom Forum, ? and !. Reviews: Torch Unicorn, Quinkey, Parfitt plotter, Turbo compiler, Multi-aid.



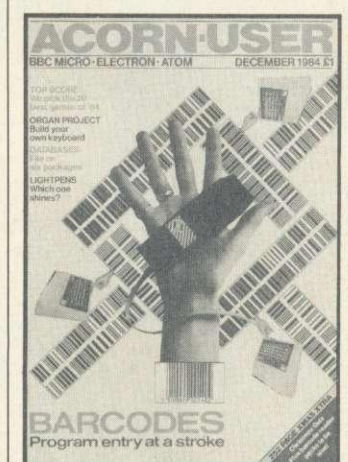
27. October The BBC and space. First Byte: noises on the Elk. Hints & Tips. Sprite design and animation part II. Programming the 8271. Sorting techniques. Diagnosing ills in the Beeb. Beeb Forum: NFS update. Education: report on government scheme, review of Microtext. Atom: wordprocessor. Communications: bulletin boards. Reviews: Basic utility ROMs, sideways ROM sockets, Bearsoft's Editor, Watford's Buffer & Backup, Ampersand's Colour module.

28. November Acorn's ABC range. First Byte: drawing. Hints & Tips: 3D-effect printing. Sprite design and animation part III. Floating point variables. ROM juggler. *Micro Live*. Education: news, Edword in the classroom, school quiz. Atom forum: hardware, the Auto command. Reviews: Six turtles and buggies. Toad's extension socket, Watford's Speech Synthesiser and



Beebfont ROM, BBtype, Romex 13 ROM board, 3 language coaching packs, two graphics tablets.

29. December Guide to bar codes. First Byte: text & graphics windows. Hints & Tips: control codes for Epsons. The Domesday project. Low-cost keyboard for the Beeb. Dumping games' screens. Speed up your micro. DIY database. Education: news, science quiz, review



of the Dudley suite of software. Atom: Forum, build a ROM pager, competition. Reviews: 6 databases compared, part I of lightpens, Acornsoft's Logo and Pascal, best games of 1984.

30. January 1985 Games special: Quadline, Picture Puzzle, musical tunes. Colourfill graphics. Hints & Tips. Operation



Raleigh report. Setting up your own teletext database. Second processors examined. Education: news, activity board revisited. Reviews: 6 wordprocessors compared, three astronomy packs, software for lightpens.

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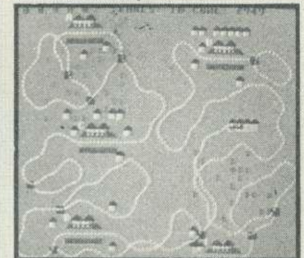
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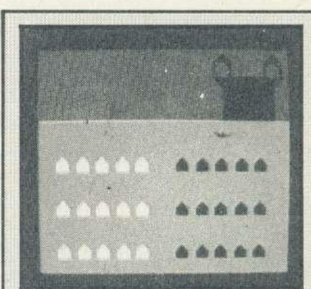


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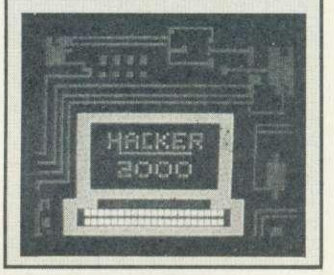


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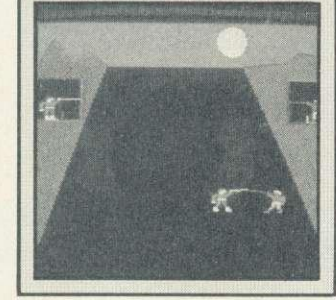





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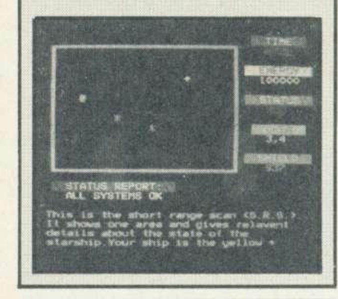
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Listing 2		●	●	●	●
Listing 3		●	●	●	●
Listing 4		●	●	●	
Listing 5		●	●	●	●
Listing 6		●	●	●	●
Listing 7		●	●	●	
Listing 8		●	●	●	●
Listing 9		●	●	●	●
First Byte: Listing 1	99	●	●	●	●
Listing 2		●	●	●	●

PROGRAM	Page	BBC B	BBC B+	6502SP	Electron
Listing 3		●	●	●	●
Listing 4		●	●	●	●
Acorn User Adventure	100	●	●	●	●
Sideways RAM Utilities	104	●	●		
Beeb Forum: Listing 1	107	●	●	●	●*
Listing 2		●	●		●
Automatic disc menus	108	●	●	●	
Close files on Break	110	●	●	●	●†
Speeding up discs: Listing 1	111	●	●	●	●†
Listing 2		●	●	●	●†
B+: Patch for using View	112		●		

** With Plus 1　　† With Plus 3*

Listing 1. Demonstrates transmission to a parallel printer

```
    1 REM Listing 1
   10 REM Sending ASCII codes to a paral
lel printer
   20 REM Martin Phillips
   30 REM BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
   60 MODE 1
   70 PROCinitialise
   80 PROCscreen
   90 PROCtransmit
  100 END
  110 :
  120 DEF PROCinitialise
  130 VDU23,128,255,255,255,255,255,255,
255,255
  140 VDU23;8202;0;0;0;
  150 PRINT"Enter message to be sent:"'
  160 INPUT message$
  170 ENDPROC
  180 :
  190 DEF PROCscreen
  200 FOR Y=6 TO 24 STEP 3
  210 COLOUR 3:PRINTTAB(0,Y);2^(8-Y/3)
  220 FOR X=3 TO 39
  230 COLOUR 2:PRINTTAB(X,Y)CHR$(128)
  240 NEXT X,Y
  250 ENDPROC
  260 :
  270 DEF PROCtransmit
  280 FOR N=1 TO LEN(message$)
  290 val=ASC(MID$(message$,N,1))
  300 VDU7
  310 FOR X=3 TO 39
  320 COLOUR 1
  330 FOR Y=6 TO 24 STEP 3
  340 IF (val AND 2^(8-Y/3))>0 THEN PRIN
TTAB(X,Y)CHR$(128)
  350 NEXT Y
  360 COLOUR 3
  370 PRINTTAB(X,27)CHR$(val)
  380 PRINTTAB(X,29);val
  390 COLOUR 2
  400 I=INKEY(20)
  410 FOR Y=6 TO 24 STEP 3
  420 PRINTTAB(X,Y)CHR$(128)
  430 NEXT Y
  440 PRINTTAB(X,27)" "
  450 PRINTTAB(X,29)"   "
  460 NEXT X,N
  470 ENDPROC
```

Listing 2. Displays ASCII codes on screen

```
    1 REM listing 2
   10 REM ASCII codes
   20 REM Martin Phillips
   30 REM For BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
   60 FOR N=32 TO 126
   70 PRINT N,"  "CHR$(N)
   80 NEXT N
   90 PRINT
```

Listing 3. Shows all ASCII codes using four columns

```
    1 REM Listing 3
   10 REM ASCII codes MODES 0-6
   20 REM Martin Phillips
   30 REM For BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
   60 MODE 1
   70 WIDTH 36
   80 @%=3
   90 FOR N=32 TO 126
  100 COLOUR 3
  110 PRINT N;"..";
  120 COLOUR 2
  130 PRINT'CHR$(N);"    ";
  140 NEXT N
  150 PRINT''
```

Listing 4. ASCII codes in teletext mode

```
    1 REM Listing 4
   10 REM ASCII codes MODE 7
   20 REM Martin Phillips
   30 REM For BBC only
   40 REM (c) Acorn User July 1985
   50 :
   60 MODE 7
   70 WIDTH 36
   80 @%=3
   90 FOR N=32 TO 126
  110 PRINT CHR$(135),N;
  130 PRINT CHR$(131);CHR$(N);"    ";
  140 NEXT N
  150 PRINT
```

Listing 5. Routine to input numbers

```
   10 REM Listing 5
   20 REM Number input routine
   30 REM Martin Phillips
   40 REM For BBC and Electron
   50 REM (c) Acorn User July 1985
   60 :
   70 CLS
   80 PRINTTAB(0,10)"Please enter an int
eger number ";
   90 PROCinputnumber
  100 PRINTTAB(0,12)"Your number was ";num
  110 END
  120 :
  130 DEF PROCinputnumber
  140 num=0
  150 REPEAT
  160 A=GET
  170 IF A<48 OR A>57 THEN GOTO 200
  180 PRINT CHR$(A);
  190 num=10*num+(A-48)
  200 UNTIL A=13
  210 ENDPROC
```


Listing 6. Routine to input names that will insert its own upper case letters

```
    1 REM Listing 6
   10 REM Name input routine version 1
   20 REM Martin Phillips
   30 REM For BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
   60 CLS
   70 PRINTTAB(0,10)"Please enter your n
ame ";
   80 PROCinputname
   90 PRINTTAB(0,12)"Hello "name$
  100 END
  110 :
  120 DEF PROCinputname
  130 name$=""
  140 REPEAT
  150 A=GET
  160 IF A>64 AND A<91 THEN A=A+32
  170 IF A>96 AND A<123 THEN PROCcheckca
ps
  180 IF(A=32 OR A=45) AND FNtest=FALSE
THEN PROCadd
  190 IF A=127 AND name$>"" name$=LEFT$(
name$,LEN(name$)-1):PRINT CHR$(A);
  200 UNTIL A=13
  210 PRINT
  220 ENDPROC
  230 :
  240 DEF PROCcheckcaps
  250 IF FNtest=TRUE THEN A=A-32
  260 PROCadd
  270 ENDPROC
  280 :
  290 DEF PROCadd
  300 name$=name$+CHR$(A):PRINT CHR$(A);
  310 ENDPROC
  320 :
  330 DEF FNtest
  340 IF name$="" THEN =TRUE
  350 IF RIGHT$(name$,1)=" " THEN =TRUE
  360 IF RIGHT$(name$,1)="-" THEN =TRUE
  370 =FALSE
```

Listing 7. Adaptation of names routine incorporating a double-height character facility

```
    1 REM Listing 7
   10 REM Name input routine version 2
   20 REM Martin Phillips
   30 REM For BBC only
   40 REM (c) Acorn User July 1985
   50 :
   60 CLS
   70 PRINTTAB(0,9)CHR$(141) CHR$(134)"P
lease enter your name"
   80 PRINTTAB(0,10)CHR$(141) CHR$(134)"
Please enter your name"
   90 PRINTTAB(0,12)CHR$(141) CHR$(131);
  100 PRINTTAB(0,13)CHR$(141) CHR$(131);
  110 PROCinputname
  120 PRINTTAB(0,16)CHR$(141) CHR$(130)"
Hello "name$
  130 PRINTTAB(0,17)CHR$(141) CHR$(130)"
Hello "name$
  140 END
  150 :
  160 DEF PROCinputname
  170 name$=""
  180 REPEAT
  190 A=GET
  200 IF A>64 AND A<91 THEN A=A+32
  210 IF A>96 AND A<123 THEN PROCcheckca
ps
  220 IF(A=32 OR A=45) AND FNtest=FALSE
THEN PROCadd
  230 IF A=127 AND name$>"" THEN PROCdel
ete
  240 UNTIL A=13
  250 PRINT
  260 :
  270 DEF PROCcheckcaps
  280 IF FNtest=TRUE THEN A=A-32
  290 PROCadd
  300 ENDPROC
  310 :
  320 DEF PROCadd
  330 name$=name$+CHR$(A)
  340 PROCprint
  350 ENDPROC
  360 :
  370 DEF FNtest
  380 IF name$="" THEN =TRUE
  390 IF RIGHT$(name$,1)=" " THEN =TRUE
  400 IF RIGHT$(name$,1)="-" THEN =TRUE
  410 =FALSE
  420 :
  430 DEF PROCdelete
  440 len=LEN(name$)
  450 name$=LEFT$(name$,len-1)
  460 PRINT CHR$(127);CHR$(9);CHR$(11);
  470 PRINT CHR$(127);CHR$(10);
  480 ENDPROC
  490 :
  500 DEFPROCprint
  510 PRINT CHR$(A);CHR$(8);CHR$(11);
  520 PRINT CHR$(A);CHR$(10);
  530 ENDPROC
```

Hints & tips continued ▶

See 'Painless Ways To Trap Those Bugs', page 145

Listing 1. Example of a procedure to find a trapable error

```
   10 REM PROCerror - the facts
   20 REM Tessie Revivis
   30 REM BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
  900 DEF PROCerror
  910 VDU 7
  920 REPORT
  930 PRINT'"Check line number ";ERL
  940 PRINT"The error number type is ";E
RR
  950 PRINT"Look in the User Guide for d
etails"
  960 ENDPROC
```

Listing 2. Automatically sets residents to zero

```
   10 REM Clear resident variables
   20 REM Tessie Revivis
   30 REM BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
   60 A%=123456:Z%=123456
   70 PROCclear
   80 PRINT "A%=";A%;"  Z%=";Z%
   90 END
  100 :
 1000 DEF PROCclear
 1010 LOCAL var%
 1020 FOR var%=&404 TO &46C STEP 4
 1030 !var%=0
 1040 NEXT
 1050 ENDPROC
```

Listing 3. Sets resident variables to a value of −1

```
   10 REM Set resident variables
   20 REM Tessie Revivis
   30 REM BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
   60 A%=123456:Z%=123456
   70 PROCset
   80 PRINT "A%=";A%;"  Z%=";Z%
   90 END
  100 :
 1100 DEF PROCset
 1110 LOCAL var%
 1120 FOR var%=&404 TO &46C STEP 4
 1130 !var%=-1
 1140 NEXT
 1150 ENDPROC
```

Listing 4. Prints the values of the resident variables

```
   10 REM Print resident variables
   20 REM Tessie Revivis
   30 REM BBC and Electron
   40 REM (c) Acorn User July 1985
   50 :
   60 FOR var%=&404 TO &46C STEP 4
   70 !var%=RND(1000)
   80 NEXT
   90 PROCl var
  100 END
  110 :
 1300 DEF PROCl var
 1310 LOCAL var%,tab%
 1320 tab%=0
 1330 CLS
 1340 PRINT" CURRENT VALUE OF INT. VARIA
BLES"
 1350 PRINT''STRING$(39,"=")
 1360 FOR var%=ASC("A") TO ASC("Z")STEP2
 1370 FOR step=1 TO 2
 1380 PRINT CHR$(var%);"% = ";
 1390 no$=(CHR$(var%)+"%")
 1400 PRINT EVAL(no$);"   ";
 1410 var%=var%+1
 1420 NEXT
 1430 var%=var%-2
 1440 PRINT
 1450 NEXT
 1460 PRINT'STRING$(39,"=")
 1470 PRINT"Press any key to continue"
 1480 A=GET
 1490 ENDPROC
```

First Byte continued ▶

◀ Hints & tips continued

Listing 8. Manipulate ASCII codes to create secret messages

```
    1 REM Listing 8
   10 REM Code creator
   20 REM Martin Phillips
   30 REM For BBC and Electron
   40 REM (c) Acorn User
   50 :
   60 PRINT"USE CAPITAL LETTERS ONLY"'
   70 INPUT"Do you want to encode or dec
ode (E/D) "question$
   80 IF question$ = "E" THEN q=1  ELSE q=-1
   90 INPUT"Enter offset 1-26 "offset
  100 INPUT"Enter passage to be coded/de
coded"'passage$
  110 code$=""
  120 FOR N=1 TO LEN(passage$)
  130 val=ASC(MID$(passage$,N,1))
  140 IF val<65 OR val>90 THEN GOTO 180
  150 val=val+q*offset
  160 IF val>90 THEN val=val-26
  170 IF val<65 THEN val=val+26
  180 code$=code$+CHR$(val)
  190 NEXT N
  200 PRINTcode$
```

Listing 9. Secret message creator and decoder using the random number generator

```
    1 REM Listing 9
   10 REM Code creator
   20 REM Martin Phillips
   30 REM For BBC and Electron
   40 REM (c) Acorn User
   50 :
   60 INPUT"Do you want to encode or dec
ode (E/D) "question$
   70 IF question$="E" THEN q=1 ELSE q=-1
   80 INPUT"Enter seed value "seed
   90 INPUT"Enter passage to be coded/de
coded"'passage$
  100 X=RND(-seed)
  110 code$=""
  120 FOR N=1 TO LEN(passage$)
  130 val=ASC(MID$(passage$,N,1))-32
  140 val=32+(95+val+q*RND(95))MOD95
  150 code$=code$+CHR$(val)
  160 NEXT N
  170 PRINTcode$
```

See 'Invent an Adventure', page 72

Entering the listing

MANY commands and words are used frequently throughout the program, so setting up the function keys will help you when it comes to keying in the listing. I suggest you run the following short program to set up the keys:

```
10 *KEY 0 DATA
20 *KEY 1 REM
30 *KEY 2 REM room
40 *KEY 3 DEF PROC
```

Use either the *Acorn User* keystrip, presented free in the October issue, or mark up your own on a length of paper, to remind you which key does what.

Take care not to insert any extra commas within the data statements or you'll find messages get muddled up. You'll know if this is happening because you'll also get a lot of funny characters, such as @s, within the body of the screen display.

You can also set up the function keys to contain the various commands you're liable to need. For example, lines 1 to 6 could be written:

```
1 *KEY 0 GO NORTH|M
2 *KEY 1 GO SOUTH|M
3 *KEY 2 GO EAST|M
4 *KEY 3 GO WEST|M
5 *KEY 4 GO UP|M
6 *KEY 5 GO DOWN|M
```

Electron conversion

The program will run on the Electron in mode 6. You'll need to make the following changes to the program:

```
  10 MODE 6
1220 PRINT f2$;s$
1780 f$=" "
1790 f1$=" "
1800 f2$=" "
1810 f3$" "
```

The following lines must be deleted: 350, 370, 1130, 1240, 1290, 1670, 1730, 2230, 2250, 2420, 2480 and 2490.

SECTION 1

```
  1 REM The Acorn User Adventure
  2 REM Joe Telford
  3 REM for BBC and 6502 SP
  4 REM Electron with mods.
  5 REM (c) Acorn User July 1985
  6 :
 10 MODE7
 20 PROCsetup
 30 PROCinstruct
 40 PROCplay
 50 END
 60 :
 70 DEFPROCplay
 80 TIME=0
 90 REPEAT
100 air=air-(rate*TIME DIV 100)
110 TIME=0
120 VDU 26:CLS
130 PROCdescroom
140 PROCdescexits
```

Continued ▶

◀ First Byte continued

Listing 5. Provides a list of all the non-resident variables used in a program

```
  10 REM List all variable names
  20 REM Tessie Revivis
  30 REM BBC and Electron
  40 REM (c) Acorn User July 1985
  50 :
  60 PROClist
  70 CALL &900
  80 END
  90 :
1400 DEF PROClist
1410 LOCAL asc,vec,stack,temp,A%,N%
1420 asc=&70:vec=&71:stack=&73:temp=&74
1430 A%=0
1440 FOR pass=0 TO 3 STEP 3
1450 P%=&900
1460 [OPT pass
1470 .variables
1480 LDA #12
1490 JSR &FFEE
1500 LDA #14
1510 JSR &FFEE
1520 LDA #65
1530 STA asc
1540 LDA #&82
1550 STA vec
1560 LDA #4
1570 STA vec+1
1580 .loop
1590 LDY #1
1600 LDA (vec),Y
1610 BEQ update
1620 STA temp
1630 LDY #0
1640 LDA (vec),Y
1650 STA stack
1660 .next_var
1670 LDA #13
1680 JSR &FFE3
1690 LDA asc
1700 JSR &FFE3
1710 LDY #2
1720 .print_loop
1730 LDA ( stack),Y
1740 BEQ end_print
1750 JSR&FFE3
1760 INY
1770 JMP print_loop
1780 .end_print
1790 LDY #1
1800 LDA ( stack),Y
1810 BEQ update
1820 TAX
1830 DEY
1840 LDA (stack),Y
1850 STA stack
1860 STX temp
1870 JMP next_var
1880 .update
1890 LDA #2
1900 CLC
1910 ADC vec
1920 CMP #&F6
1930 BEQ finished
1940 STA vec
1950 INC asc
1960 JMP loop
1970 .finished
1980 LDA #13
1990 JSR &FFE3
2000 LDA #15
2010 JSR &FFE3
2020 RTS
2030 ]
2040 NEXT
2050 FOR N%=&900 TO &966
2060 A%=A%+?N%:NEXT
2070 IF A%=12788 THEN ENDPROC
2080 PRINT"Error - check listing"
2090 END
```

◀ Continued

```
150 PROCdescboxes
160 PROCair
170 REPEAT
180 PROCgetaction
190 PROCdoaction
200 UNTIL ok
210 VDU 7
220 delay=TIME+time
230 REPEAT UNTIL TIME>delay
240 TIME=TIME-time
250 air=air-(rate*TIME DIV 100)
260 UNTIL room=15 OR air<=0
270 VDU26
280 CLS
290 PROCdescroom
300 IF air<=0 AND room<>15 PROCdie
310 ENDPROC
320 :
330 DEFPROCdie
340 PRINT f3$"You have no air left."
350 PRINT f3$"You have no air left."
360 PRINT f3$"Game over."
370 PRINT f3$"Game over."
380 ENDPROC
390 :
400 DEFPROCdoaction
410 ok=FALSE
420 IF INSTR(cm$,"NORTH") PROCdir("N")
430 IF INSTR(cm$,"SOUTH") PROCdir("S")
440 IF INSTR(cm$,"EAST") PROCdir("E")
450 IF INSTR(cm$,"WEST") PROCdir("W")
460 IF INSTR(cm$,"UP") PROCdir("U")
470 IF INSTR(cm$,"DOWN") PROCdir("D")
480 IF cm$=magic$ AND room=13 PROCmagic
490 IF VALcm$>0 PROCboxval
500 IF NOT ok PRINT "Nothing happens"
510 ENDPROC
520 :
530 DEFPROCmagic
540 chamber$(13,1)="It thunders and "
550 chamber$(13,2)="A lightning bolt "
560 chamber$(13,3)="smashes the tree"
570 route$(13,2)="SU15"
580 ok=-1
590 ENDPROC
600 :
610 DEFPROCboxval
620 LOCAL b$
630 b$ = box$(room)
640 IF b$="" ENDPROC
650 IF b$>"" THEN IF VALcm$<>360/s PROC
vanish :ENDPROC
660 ok=TRUE
670 IF b$="@" PROCairmess:ENDPROC
680 PRINT"The box opens and you see "
690 PRINT"the letter ";b$;" fade away"
700 box$(room)="O"
710 ENDPROC
720 :
730 DEFPROCairmess
740 PRINT"Air rushes out of the box"
750 PRINT"and it vanishes"
760 air=air+extra
770 box$(room)=""
780 ENDPROC
790 :
800 DEFPROCvanish
810 LOCAL rm
820 PRINT"The box hums, then vanishes"
830 REPEAT
840 rm = RND(rooms-1)
850 UNTIL box$(rm) = ""
860 box$(rm) = box$(room)
870 box$(room) = ""
880 ok = TRUE
890 ENDPROC
900 :
910 DEFPROCdir(x$)
920 LOCAL dir$,nxtrm
930 route = 0
940 REPEAT
950 route=route+1
960 dir$=MID$(route$(room,route),2,1)
970 nxtrm=VAL(MID$(route$(room,route),3
,2))
980 IF x$=dir$:ok=TRUE:room=nxtrm
990 IF x$=dir$:UNTILTRUE:ENDPROC
1000 UNTILdir$="@" OR route=6
1010 PRINT"You can't go that way!"
1020 ok=TRUE
1030 ENDPROC
1040 :
1050 DEFPROCgetaction
1060 PRINT "What now? ";
1070 INPUTLINE""cm$
1080 ENDPROC
1090 :
1100 DEFPROCair
1110 IF air<0 air=0
1120 PRINTTAB(26,0);f2$;"Air:";f3$;air
1130 PRINTTAB(26,1);f2$;"Air:";f3$;air
1140 VDU28,0,24,39,yscreen
1150 ENDPROC
1160 :
1170 DEFPROCdescboxes
1180 IF box$(room)="" yscreen=VPOS:ENDPR
OC
1190 IF box$(room)="@" s=10:s$="A box wi
th a 10 sided lid"
1200 IF box$(room)<>"@":REPEAT:s=RND(7)+
2:s$="A box with a "+STR$(s)+" sided lid"
:UNTIL s<>7
1210 IF box$(room)="O" s$="A slowly vani
shing box":box$(room)=""
1220 PRINT'f2$;s$'f2$;s$
1230 pos=RND(3)
1240 FOR loop = 1 TO 2
1250 PRINTf2$;"lies ";
1260 IF pos=1 PRINT" on the floor"
1270 IF pos=2 PRINT" on a desk"
1280 IF pos=3 PRINT" in a corner"
1290 NEXT loop
1300 yscreen = VPOS
1310 ENDPROC
1320 :
1330 DEFPROCdescexits
1340 route=0
1350 PRINT
1360 REPEAT
1370 route=route+1
1380 fst$=MID$(route$(room,route),1,1)
1390 IF fst$="@" PRINT: yscreen = VPOS
1400 IF fst$="@" UNTIL TRUE:ENDPROC
1410 IF fst$="C" PRINT f1$;"A corridor l
eads ";
1420 IF fst$="P" PRINT f1$;"A passage le
ads ";
1430 IF fst$="T" PRINT f1$;"A tunnel lea
ds ";
1440 IF fst$="S" PRINT f1$;"Some steps l
ead ";
1450 IF fst$="D" PRINT f1$;"A door opens
 to the ";
1460 IF fst$="X" PRINT f1$;"This is a de
ad end."
1470 IF fst$="E";PRINT f1$;"You have fou
nd the exit."
1480 scnd$=MID$(route$(room,route),2,1)
1490 IF scnd$="U" PRINT "up."
```

SECTION 1 / SECTION 2 / SECTION 3

Continued ▶

◀ Continued

SECTION 3

```
1500 IF scnd$="N" PRINT "north."
1510 IF scnd$="S" PRINT "south."
1520 IF scnd$="D" PRINT "down."
1530 IF scnd$="E" PRINT "east."
1540 IF scnd$="W" PRINT "west."
1550 UNTIL fst$="@"
1560 ENDPROC
1570 :
1580 DEFPROCdescroom
1590 PROCprint("You are in the ",chamber
$(room,0))
1600 FOR line=1 TO lines
1610 PROCprint("",chamber$(room,line))
1620 NEXT
1630 ENDPROC
1640 :
1650 DEFPROCprint(pre$,tx$)
1660 IFpre$>"" PRINTf$;pre$'f$;pre$
1670 FOR count=1 TO 2
1680 PRINTf$;
1690 FOR loop = 1 TO LENtx$
1700 PRINTCHR$(ASC(MID$(tx$,loop,1)));
1710 NEXT loop
1720 PRINT
1730 NEXT count
1740 ENDPROC
1750 :
```

SECTION 4

```
1760 DEFPROCsetup
1770 time=200
1780 f$ = CHR$141 + CHR$131
1790 f1$ = CHR$32 + CHR$130
1800 f2$ = CHR$141 + CHR$133
1810 f3$ = CHR$141 + CHR$134
1820 RESTORE 3200
1830 READ rooms,lines,routes,boxes
1840 READ air,rate,extra
1850 lines = lines - 1
1860 DIM chamber$(rooms,lines)
1870 DIM route$(rooms,routes)
1880 DIM box$(rooms)
1890 FOR room=1 TO rooms
1900 READ chamber$(room,0)
1910 FOR line=1 TO lines
1920 READ chamber$(room,line)
1930 NEXT
1940 FOR route= 1 TO routes
1950 READ route$(room,route)
1960 NEXT
1970 NEXT
1980 READ magic$
1990 FOR box= 1 TO LENmagic$
2000 REPEAT
2010 room=RND(rooms-1)
2020 UNTILbox$(room)=""
2030 box$(room)=MID$(magic$,box,1)
2040 NEXT
2050 FOR box= LENmagic$ +1 TO boxes
2060 REPEAT
2070 room=RND(rooms-1)
2080 UNTIL box$(room)=""
2090 box$(room)="@"
2100 NEXT
2110 REM startroom
2120 room=RND(rooms-1)
2130 ENDPROC
2140 :
```

SECTION 5

```
2150 REM Instructions for playing
2160 REM the Adventure.
2170 :
2180 DEFPROCinstruct
2190 LOCAL A$,text$,length,f$
2200 f$ = CHR$141 + CHR$131
2210 CLS
2220 PRINTTAB(2,5);f$"The Acorn User"
2230 PRINTTAB(2,6);f$"The Acorn User"
2240 PRINTTAB(5,8);f$"Adventure"
2250 PRINTTAB(5,9);f$"Adventure"
2260 REPEAT
2270 PRINTTAB(15,12)"Instructions? ";
2280 A$=GET$
2290 UNTIL INSTR("YyNn",A$)>0
2300 PRINTA$
2310 IF A$="N" OR A$="n":ENDPROC
2320 CLS
2330 :
2340 RESTORE 2560
2350 REPEAT
2360 READ text$
2370 IF text$="*" PROCspace:UNTIL0
2380 IF text$="**" UNTIL TRUE:ENDPROC
2390 text$ = f$+text$
2400 length = LEN(text$)
2410 PRINT TAB(20-length/2);text$
2420 PRINT TAB(20-length/2);text$
2430 UNTIL FALSE
2440 :
2450 DEFPROCspace
2460 PRINT TAB(15,22);
2470 PRINT CHR$141;CHR$130;"<SPACE>"
2480 PRINT TAB(15,23);
2490 PRINT CHR$141;CHR$130;"<SPACE>"
2500 *FX21,0
2510 REPEAT UNTIL GET=32
2520 CLS
2530 PRINT''
2540 ENDPROC
2550 :
2560 DATA Having just finished typing
2570 DATA the last few lines of the
2580 DATA Acorn User Teleport Program,
2590 DATA you decide to test it by
2600 DATA sending your neighbour to a
2610 DATA rather uninviting place.
2620 DATA *
2630 DATA Unfortunately, in entering
2640 DATA the program you have read O
2650 DATA as 0 with the result that it
2660 DATA is YOU who hurtles into the
2670 DATA darkness.
2680 DATA *
2690 DATA You awake to see the ugly
2700 DATA "face of Mad Alex, leering"
2710 DATA above you.
2720 DATA " "," "
2730 DATA He explains your problem:
2740 DATA "*"
2750 DATA """Sneaked that bug into"
2760 DATA "The commander's Proggy,"""
2770 DATA chortles Alex.
2780 DATA " "
2790 DATA """Wanted more real peoples"
2800 DATA to visit me.
2810 DATA "Fed up with just Simon."""
2820 DATA *
2830 DATA """Gorra ard problem!"
2840 DATA Just find ya way outta here.
2850 DATA S'easy really. 'Cept that
2860 DATA ya'll need a magic wurd
2870 DATA "teropen the last door."""
2880 DATA *
2890 DATA """That wurd's lerrers'r"
2900 DATA in diffrent shaped boxes and
2910 DATA the boxes are sensitive to
2920 DATA ya voice.
2930 DATA If ya call out the
2940 DATA "right number they'll open,"
2950 DATA but if ya give the wrong
2960 DATA number they'll teleport to
2970 DATA "another room."""
2980 DATA *
```

Continued ▶

◀ Continued

```
2990 DATA """When ya get the lerrers"
3000 DATA ya'll hafta make a good wurd
3010 DATA "with em, ter gerrout."
3020 DATA " "
3030 DATA An just fer good measure -
3040 DATA Ah'v turned the air supply
3050 DATA "off. Have a good time."""
3060 DATA *
3070 DATA Alex vanishes and you
3080 DATA stagger to your feet.
3090 DATA Although gloomy there is
3100 DATA light to see your way.
3110 DATA " "," "
3120 DATA So begins the adventure!
3130 DATA *,**
3140 :
3150 REM 15 chambers, 4 lines each
3160 REM maximum of 6 directions.
3170 REM 10 boxes.1200 units of air
3180 REM used at 5 units per sec,
3190 REM replaced at 100 units per box.
3200 DATA 15,4,6,10,1200,5,100
3210 :
3220 REM room1
3230 DATA Chamber of Abuse.
3240 DATA Faded pictures of Welsh Leeks
3250 DATA and Americanised Beebs
3260 DATA fill the walls.
3270 DATA TE2,XX0,@,@,@,@
3280 :
3290 REM room2
3300 DATA Phantom Photocopier's Den.
3310 DATA A strange smell of ozone
3320 DATA blended with the flavour of
3330 DATA exotic crisps fills the air.
3340 DATA TW1,PS9,CE3,@,@,@
3350 :
3360 REM room3
3370 DATA Writer's Cramped Room.
3380 DATA In this tiny space you
3390 DATA see the rusted tripewriters
3400 DATA of overworked AU authors.
3410 DATA CW2,SU7,@,@,@,@
3420 :
3430 REM room4
3440 DATA Kitty Corner.
3450 DATA Etched into the imitation
3460 DATA chipboard are the cryptic
3470 DATA words 'Kitty luvs ...
3480 DATA PE5,CS8,@,@,@,@
3490 :
3500 REM room5
3510 DATA Quinn Hideaway.
3520 DATA Signs of life have almost
3530 DATA vanished from this
3540 DATA room.
3550 DATA PW4,XX0,@,@,@,@
3560 :
3570 REM room6
3580 DATA Complaints Department.
3590 DATA This chamber is thick with
3600 DATA the blood of those who came
3610 DATA to offer less than praise.
3620 DATA DE7,XX0,@,@,@,@
3630 :
3640 REM room7
3650 DATA Commander's Chamber.
3660 DATA This evil room is filled
3670 DATA with blunt soldering irons -
3680 DATA used to open beer cans!
3690 DATA SD3,DW6,TN13,@,@,@
3700 :
3710 REM room8
3720 DATA Back Issues Room.
3730 DATA Empty cabinets stand along
3740 DATA each wall - any sound echos
3750 DATA back and forth between them.
3760 DATA CN4,TE9,DS11,@,@,@
3770 :
3780 REM room9
3790 DATA Finance Manager's Office.
3800 DATA Signs of great turbulence are
3810 DATA visible (including several
3820 DATA broken piggy banks).
3830 DATA PN2,TW8,CE10,@,@,@
3840 :
3850 REM room10
3860 DATA Communications Room.
3870 DATA A message has been received
3880 DATA from Acorn saying ...
3890 DATA OLIwho?
3900 DATA CW9,TD14,@,@,@,@
3910 :
3920 REM room11
3930 DATA Mad Alex Cell.
3940 DATA You see Alex has cornered the
3950 DATA market on decomposing gold-
3960 DATA covered chocolate ear-rings.
3970 DATA DN8,PE12,@,@,@,@
3980 :
3990 REM room12
4000 DATA Techno-torture Chamber.
4010 DATA Around are the remains of
4020 DATA slipped disc drives;  QL64s
4030 DATA and dead Atary-macs.
4040 DATA PW11,XX0,@,@,@,@
4050 :
4060 REM room13
4070 DATA Redwood Reception.
4080 DATA The way out is barred by a
4090 DATA MAGIC Redwood tree
4100 DATA tinselled in red and grey.
4110 DATA CS7,SU13,@,@,@,@
4120 :
4130 REM room14
4140 DATA Dungeon entrance.
4150 DATA Through the locked gates
4160 DATA you can see where Dwarves
4170 DATA and Trolls have Dallyed.
4180 DATA TU10,XX0,@,@,@,@
4190 :
4200 REM room15
4210 DATA Acorn User doorway.
4220 DATA Daylight floods in as you
4230 DATA stagger out into the safety
4240 DATA of Long Acre.
4250 DATA SD13,EE0,@,@,@,@
4260 :
4270 REM the magic word
4280 DATA META
```

(Section 5: lines 2990–3130; Section 6: lines 3140–4280)

See 'A Sideways Glance at Disc Utilities', page 83

How to enter the program

To enable you to use this month's instalment of the sideways RAM utilities, you'll need the source code from the June issue and a copy of the magazine itself.

Enter and run the first program presented on page 102 of last month's issue to set up the function keys with the main assembler mnemonics, and so reducing the amount of typing you'll have to do. Place the function key strip (page 103, June) above the red function keys.

Enter the program as shown, using the line numbers given. Do not enter the final line (number 20765) at this stage. Save what you have just entered.

To allow a checksum to be generated from this listing it needs some dummy variables to be defined. Add the following lines to your program:

```
    1 REM 5000 TO 55B9
    5 X=&70:Y=&8000:Z=&5000
   10 brk=X:brk2=X:end=Y
   20 s2=Z:sterr=Y:err1=Y
   30 inuse=X:err=Y:recog=Y
   40 temp=X:mem=X:himem=X
   50 push=Y:page=X:newpage=X
   60 pull=Y:stop=Y:param=X
   70 buffer=Y:escape=Y:cat=Y
   80 temp3=X:temp6=X:temp1=X
   85 temp5=X:space=Y:space2=Y
   86 temp2=X:message=Y:offset=Y
   87 temp4=X:syntax=Y
  100 FOR PASS=0 TO 3 STEP 3
  110 P%=&5000
  120 [OPT PASS

15000 ]NEXT
15010 A%=0
15020 FOR N%=&5000 TO &55B9
15030 A%=A%+?N%
15040 NEXT
15050 PRINT"CHECKSUM IS :";A%
15060 REM SHOULD BE 163061
```

Now RUN the program. After a few seconds delay the assembly listing will be seen on the screen. A short delay will occur while the program calculates its own checksum. This will be printed on the screen thus:

CHECKSUM IS :163061

If you obtain another figure, recheck your listing carefully. It's quite easy to make an error with the assembly listing running correctly. Once the checksum is correct, delete lines 1 to 160 and 15000 to 15060 inclusive. Finally, add line 20765 from the main listing.

The next stage is to combine the current listing with last month's listing, this is done by using *SPOOL and *EXEC as follows. Save the current listing thus:

```
*SPOOL PART2
LIST
*SPOOL
```

As the program lists it will be written to the program file, PART2.

It's worth saving the program so far at this point for back-up purposes, ie SAVE "BACKUP2".

Now load in last month's listing – you should have it saved! Merging it with this month's is straightforward. Cassette users should rewind their tapes so that they are at the front of the spooled file PART2. This can then be loaded in by entering:

*EXEC PART2

The listing should appear on the screen as it is loaded.

Once loading has finished, list the program to make sure it is okay and RUN it. If there are no errors save the source code under a new filename for use next month. To save the RAM object code, re-RUN the program to assemble the code in the sideways RAM and then use the second program presented on page 102 of the June issue following the instructions given there.

User RAM

Adapting the program for use in the *Acorn User* UserRAM is reasonably straightforward. However it's not possible to write directly to the UserRAM simply with a *LOAD 8000 command. Loading into the UserRAM must take place as if you were writing to the particular ROM socket via the ROM Page Select Register; this loading program is supplied with the UserRAM package.

This means that the machine code must first be assembled into the normal memory map so that it will work from &8000 onwards. Basically this means that all absolute addresses must be altered.

Basic 2 owners can do this quite simply by invoking use of the 0% assembly parameters and OPT 4 and 7 as follows. First type in the listing and save it. Now set PAGE = &1200 and load the program in. Alter lines 40 and 50 thus:

```
40FOR J% = 4 TO 7 STEP 3
50P% = &8000 : 0% = &6D00
```

RUN the program, correcting any mistakes. The machine code will assemble from &6D00 but will work from &8000. Now save the machine code with:

*SAVE RAMUTIL 6D00 72BA

and then load as specified in the UserRAM manual.

Basic 1 owners have to work a bit harder as the 0% function does not exist. What you need do is to add and offset to every absolute address reference. Load and save the program as described above and reload at &1200. Now enter the following lines:

```
5  D = &1300
50 P% = &6D00
```

leave line 40 as it appears in the original listing.

Add ' + D' to each absolute address reference, eg:

```
230 JSR shift + D
240 .bre2 JMP end + D
```

don't forget to include references to labels where these are defined with absolute addresses eg:

```
180 LDA brk + D
```

When completed RUN and save the machine code with:

*SAVE RAMUTIL 6D00 72BA 8000 8000

Check the absolute references carefully and then load into UserRAM as described in the manual.

```
 170 .break
 180 LDA brk
 190 BEQ bre1
 200 JSR movedown
 210 .bre1 LDA brk2
 220 BEQ bre2
 230 JSR shift
 240 .bre2 JMP end
 250 :
 950 .s1 CMP #6
 953 BNE s2
 956 JMP break
1410 .co16 CMP #&58
1420 BNE co11
1430 LDA inuse
1440 BNE comerr
1450 JMP movedata
1460 .comerr JSR sterr
1470 LDX #68
1480 LDY #11
1490 JSR err1
1500 LDX #83
1510 LDY #7
1520 JMP err
1530 .co11 LDY temp
1540 LDX #41
1550 JSR recog
1560 BNE co2
1570 LDX #3
1580 JMP format
1590 .co2 LDY temp
1600 LDX #46
1610 JSR recog
1620 BNE co3
1630 LDX #2
1640 JMP format
```

```
1650 .co3 LDY temp
1660 LDX #50
1670 JSR recog
1680 BNE co4
1690 LDX #4
1700 JMP format
1710 .co4 LDY temp
1720 LDX #56
1730 JSR recog
1740 BNE co5
1750 LDX #0
1760 JMP format
1770 .co5 LDY temp
1780 LDX #63
1790 JSR recog
1800 BNE co6
1810 LDX #1
1820 JMP format
1830 .co6
6890 .movedata
6900 INY
6910 TYA
6920 PHA
6930 LDA #1
6940 STA brk
6950 LDA #32
6960 STA mem
6970 JSR push
6980 LDA #&84
6990 JSR &FFF4
7000 STY himem
7010 LDX #0
7020 LDY #&FF
7030 LDA #&B4
7040 JSR &FFF4
7050 STX page
7060 LDA himem
7070 SEC
7080 SBC #&20
7090 TAY
7100 .di1 CPY page
7110 BCS di2
7120 INY
7130 DEC mem
7140 BNE di1
7150 .di2 TYA
7160 STA &71
7170 STA newpage
7180 TAX
7190 LDY #0
7200 LDA #&B4
7210 JSR &FFF4
7220 LDA #&A0
7230 STA &73
7240 JSR move
7250 JSR pull
7260 PLA
7270 PHA
7280 TAY
7290 LDX #4
7300 LDA #&8F
7310 JSR &FFF4
7320 PLA
7330 CPX #0
7340 BEQ di3
7350 CLC
7360 ADC &F2
7370 TAX
7380 LDY &F3
7390 LDA #3
7400 JSR osfsc
7410 .di3 JSR movedown
7420 JMP stop
7430 :
7440 .osfsc
7450 JMP (&21E)
7460 RTS
7470 :
7480 .move
7490 LDX mem
7500 LDY #0
7510 STY &70
7520 STY &72
7530 .mov1 LDA (&70),Y
7540 STA (&72),Y
7550 INY
7560 BNE mov1
7570 INC &71
7580 INC &73
7590 DEX
7600 BNE mov1
7610 RTS
7620 :
7630 .movedown
7640 JSR push
7650 LDA #&A0
7660 STA &71
7670 LDA newpage
7680 STA &73
7690 JSR move
7700 JSR pull
7710 LDA #&B4
7720 LDY #0
7730 STY brk
7740 LDX page
7750 JSR &FFF4
7760 RTS
7770 :
7780 .print
7790 TAX
7800 AND #&F0
7810 LSR A
7820 LSR A
7830 LSR A
7840 LSR A
7850 JSR prout
7860 TXA
7870 AND #&F
7880 JSR prout
7890 LDA #&20
7900 JSR &FFEE
7910 JSR &FFEE
7920 TXA
7930 JSR decimal
7940 RTS
7950 :
7960 .prout
7970 CMP #&A
7980 BCC pro1
7990 CLC
8000 ADC #7
8010 .pro1 ADC #&30
8020 JSR &FFEE
8030 RTS
8040 :
8050 .decimal
8060 LDY #&30
8070 .dec2 CMP #10
8080 BCC dec1
8090 SBC #10
8100 INY
8110 BNE dec2
8120 .dec1 PHA
8130 TYA
8140 CMP #&30
8150 BNE dec3
8160 LDA #&20
8170 .dec3 JSR &FFEE
8180 PLA
8190 CLC
8200 ADC #&30
8210 JSR &FFEE
8220 RTS
8230 :
8240 .getch
8250 INY
8260 LDA (&F2),Y
8270 CMP #&20
8280 BEQ getch
8290 CMP #&D
8300 BNE getc1
8310 JMP diserr
8320 .getc1 RTS
8330 :
8340 .param1
8350 LDA temp
8360 STA param
8370 LDA #buffer MOD 256
8380 STA param+1
8390 LDA #buffer DIV 256
8400 STA param+2
8410 LDA #0
8420 STA param+3
8430 STA param+4
8440 RTS
8450 :
8460 .param2
8470 LDA #5
8480 STA param+5
8490 LDA #&63
8500 STA param+6
8510 LDA temp3
8520 STA param+7
8530 LDA #21
8540 STA param+8
8550 LDA #&2A
8560 STA param+9
8570 LDA #0
8580 STA param+10
8590 LDA #&10
8600 STA param+11
8610 RTS
8620 :
8630 .param3
8640 STA param+6
8650 LDA #3
8660 STA param+5
8670 STX param+7
8680 STY param+8
8690 LDA #&22
8700 STA param+9
8710 RTS
8720 :
8730 .doverif
8740 LDA #&5F
8750 LDX temp3
8760 LDY #0
8770 JSR param3
8780 LDA #&2A
8790 STA param+9
8800 LDX #10
8810 JSR disc
8820 RTS
8830 :
8840 .seektr
8850 STA param+7
8860 LDA #1
8870 STA param+5
8880 LDA #&69
8890 STA param+6
8900 LDX #8
8910 JSR disc
8920 BEQ seek1
8930 JMP errdis
8940 .seek1 RTS
8950 :
8960 .disc
8970 STX temp6
8980 LDX #param MOD 256
8990 LDY #param DIV 256
9000 LDA #&7F
9010 JSR &FFF1
9020 LDX &FF
9030 BPL disc1
9040 JMP escape
9050 .disc1 LDX temp6
9060 LDA param,X
9070 RTS
9080 :
9090 .catolog
9100 LDA #&D
9110 STA param+15
9120 LDA temp1
9130 STA param+14
9140 LDX #(param+14)MOD 256
9150 LDY #(param+14)DIV 256
9160 LDA #5
9170 JMP osfsc
9180 :
9190 .buftocat
9200 LDY #0
9210 .buf1 LDA buffer,Y
9220 STA cat,Y
9230 LDA buffer+256,Y
9240 STA cat+256,Y
9250 INY
9260 BNE buf1
9270 RTS
9280 :
9290 .cattobuf
9300 LDY #0
9310 .buf2 LDA cat,Y
9320 STA buffer,Y
9330 LDA cat+256,Y
9340 STA buffer+256,Y
9350 INY
9360 BNE buf2
9370 RTS
9380 :
9390 .swapcat
9400 LDY #0
9410 .buf3 LDA cat,Y
9420 TAX
9430 LDA buffer,Y
9440 STA cat,Y
9450 TXA
9460 STA buffer,Y
9470 LDA cat+256,Y
9480 TAX
9490 LDA buffer+256,Y
9500 STA cat+256,Y
9510 TXA
9520 STA buffer+256,Y
9530 INY
9540 BNE buf3
9550 RTS
9560 :
9570 .format
9580 STX temp5
9590 CMP #&D
9600 BEQ for16
9610 JSR getch
9620 CMP #&34
9630 BCS for16
9640 STA temp1
9650 AND #&3
9660 STA temp
9670 LDX #1
9673 STX brk2
9676 DEX
9680 .fora LDA &B00,X
9690 STA space,X
9700 LDA &C00,X
9710 STA space+256,X
9720 INX
9730 BNE fora
9740 LDX #&F
9750 .forb LDA &9F0,X
9760 STA space2,X
9770 DEX
9780 BPL forb
9790 JSR param1
9800 LDA temp5
9810 BEQ for1
9820 JMP verify
9830 .for1 INY
9840 LDA (&F2),Y
9850 CMP #&20
9860 BEQ for15
9870 .for16 JMP diserr
9880 .for15 JSR getch
9890 CMP #&33
9900 BNE for2
9910 LDA #35
9920 BNE for4
9930 .for2 CMP #&34
9940 BNE for3
9950 LDA #40
9960 BNE for4
9970 .for3 CMP #&38
9980 BNE for16
9990 LDA #80
10000 .for4 STA temp2
10010 LDX #131
10020 LDY #26
10030 JSR message
10040 LDA temp1
10050 JSR &FFEE
10060 LDX #158
10070 LDY #28
10080 JSR message
10090 .for5 JSR &FFE0
10100 BCC for17
10110 JMP escape
10120 .for17 CMP #32
10130 BNE for5
10140 LDA #0
10150 STA temp1
10160 STA temp3
10170 JSR seektr
10180 .for6 LDY temp1
10190 LDX #0
10200 LDA offset,Y
10210 STA temp4
10220 LDY #&A
10230 .for7 LDA temp3
10240 STA buffer,X
10250 INX
10260 LDA #0
10270 STA buffer,X
10280 INX
10290 LDA temp4
10300 STA buffer,X
10310 CLC
10320 ADC #1
10330 CMP #&A
10340 BNE for18
10350 LDA #0
10360 .for18 STA temp4
10370 INX
10380 LDA #1
10390 STA buffer,X
10400 INX
10410 DEY
10420 BNE for7
10430 LDA #&A
10440 STA temp5
10450 .for8 LDX #12
10460 JSR param2
10470 JSR disc
10480 BEQ for10
10490 .for9 DEC temp5
10500 BNE for8
10510 JMP errdis
```

```
10520 .for10 JSR doverif
10530 BNE for9
10540 LDA temp3
10550 JSR print
10560 LDA #&D
10570 JSR &FFEE
10580 LDY temp1
10590 INY
10600 CPY #&A
10610 BNE for11
10620 LDY #0
10630 .for11 STY temp1
10640 LDY temp3
10650 INY
10660 STY temp3
10670 CPY temp2
10680 BNE for6
10690 JSR blankbuf
10700 LDA temp2
10710 CMP #80
10720 BNE for13
10730 LDA #3
10740 LDX #&20
10750 BNE for14
10760 .for13 CMP #40
10770 BNE for25
10780 LDX #&90
10790 BNE for26
10800 .for25 LDX #&5E
10810 .for26 LDA #1
10820 .for14 STA buffer
      +262
10830 STX buffer+263
10840 LDX #0
10850 LDY #0
10860 LDA #&4B
10870 JSR transfer
10880 LDX #186
10890 LDY #7
10900 JSR message
10910 JMP stop
10920 :
10930 .verify
10940 LDA #&53
10950 LDY #0
10960 LDX #0
10970 JSR transfer
10980 LDY #1
10990 LDA buffer+263
11000 CMP #&20
11010 BEQ ver1
11020 CMP #&8E
11030 BNE ver2
11040 DEY
11050 .ver1 LDA #80
11060 LDX #39
11070 BNE ver6
11080 .ver2 CMP #&90
11090 BEQ ver3
11100 CMP #&C6
11110 BNE ver4
11120 DEY
11130 .ver3 LDA #40
11140 LDX #19
11150 BNE ver6
11160 .ver4 CMP #&5E
11170 BEQ ver5
11180 DEY
11190 .ver5 LDA #35
11200 LDX #17
11210 .ver6 STA temp2
11220 STX temp3
11230 STY temp4
11240 CPY #0
11250 BEQ ver12
11260 LDY buffer+261
11270 LDA buffer,Y
11280 CMP #&2E
11290 BNE ver12
11300 DEC temp4
11310 .ver12 LDA temp5
11320 CMP #1
11330 BEQ ver7
11340 JMP inventory
11350 .ver7 JSR &FFE7
11360 JSR &FFE7
11370 LDA temp2
11380 JSR print
11390 LDX #192
11400 LDY #9
11410 JSR message
11420 LDX #201
11430 LDY #7
11440 LDA temp4
11450 BEQ ver8
11460 LDX #208
11470 LDY #11
11480 .ver8 JSR message
11490 LDA #0
11500 STA temp3
11510 STA temp5
11520 .ver9 JSR doverif
11530 BEQ ver10
11540 LDX #218
11550 LDY #15
11560 JSR message
11570 LDA temp3
11580 JSR print
11590 INC temp5
11600 .ver10 LDY temp3
11610 INY
11620 STY temp3
11630 CPY temp2
11640 BNE ver9
11650 LDA temp5
11660 BNE ver11
11670 LDX #186
11680 LDY #7
11690 JSR message
11700 .ver11 JMP stop
11710 :
11720 .inventory
11730 LDA temp5
11740 CMP #4
11750 BNE inv1
11760 JMP split
11770 .inv1 LDY temp4
11780 BEQ inv2
11790 JMP spliterr
11800 .inv2 CMP #3
11810 BNE inv3
11820 JMP swap
11830 .inv3 LDA #&75
11840 JSR &FFF4
11850 TXA
11860 AND #4
11870 PHA
11880 BNE inv4
11890 LDA #14
11900 JSR &FFEE
11910 .inv4 LDA #&53
11920 LDY #0
11930 LDX #0
11940 JSR transfer
11950 JSR catalog
11960 JSR buftocat
11970 LDA #&53
11980 LDY #8
11990 LDX temp3
12000 JSR transfer
12010 LDA #&4B
12020 LDY #0
12030 LDX #0
12040 JSR transfer
12050 JSR cattobuf
12060 JSR catalog
12070 LDA #&4B
12080 LDY #0
12090 LDX #0
12100 JSR transfer
12110 PLA
12120 BNE inv6
12130 LDA #15
12140 JSR &FFEE
12150 .inv6 JMP stop
12160 :
12170 .swap
12180 LDA #&53
12190 LDY #0
12200 LDX #0
12210 JSR transfer
12220 JSR buftocat
12230 LDA #&53
12240 LDY #8
12250 LDX temp3
12260 JSR transfer
12270 JSR swapcat
12280 LDA #&4B
12290 LDY #8
12300 LDX temp3
12310 JSR transfer
12320 JSR cattobuf
12330 LDA #&4B
12340 LDY #0
12350 LDX #0
12360 JSR transfer
12370 JMP stop
12380 :
12390 .split
12400 LDY temp4
12410 BNE spl1
12420 JMP spliterr2
12430 .spl1 LDA #&53
12440 LDX #0
12450 LDY #0
12460 JSR transfer
12470 LDA buffer+261
12480 BEQ spl2
12490 LDX #233
12500 LDY #21
12510 JSR message
12520 LDX #158
12530 LDY #28
12540 JSR message
12550 .spl3 JSR &FFE0
12560 BCC spl4
12570 JMP escape
12580 .spl4 CMP #32
12590 BNE spl3
12600 .spl2 LDA temp2
12610 CMP #80
12620 BNE spl5
12630 LDA #&20
12640 PHA
12650 LDA #3
12660 PHA
12670 LDA #1
12680 LDX #&8E
12690 BNE spl6
12700 .spl5 CMP #40
12710 BNE spl7
12720 LDX #&C6
12730 LDA #&90
12740 BNE spl8
12750 .spl7 LDX #&A8
12760 LDA #&5E
12770 .spl8 PHA
12780 LDA #1
12790 PHA
12800 LDA #0
12810 .spl6 STX buffer
      +263
12820 PHA
12830 AND buffer+262
12840 STA buffer+262
12850 TXA
12860 PHA
12870 LDA #&4B
12880 LDX #0
12890 LDY #0
12900 JSR transfer
12910 JSR blankbuf
12920 LDY #7
12930 LDA #&2E
12940 .spl9 STA buffer
      +8,Y
12950 DEY
12960 BPL spl9
12970 PLA
12980 STA buffer+269
12990 PLA
13000 ASL A
13010 ASL A
13020 ASL A
13030 ASL A
13040 STA buffer+270
13050 LDA #2
13060 STA buffer+271
13070 PLA
13080 STA buffer+262
13090 PLA
13100 STA buffer+263
13110 LDA #8
13120 STA buffer+261
13130 LDA #&4B
13140 LDX temp3
13150 LDY #8
13160 JSR transfer
13170 JMP stop
13180 :
13190 .shift
13200 LDY #0
13210 STY brk2
13220 .shi1 LDA space,Y
13230 STA &B00,Y
13240 LDA space+256,Y
13250 STA &C00,Y
13260 INY
13270 BNE shi1
13280 LDY #&F
13290 .shi2 LDA
      space2,Y
13300 STA &9F0,Y
13310 DEY
13320 BPL shi2
13330 RTS
13340 :
13350 .spliterr
13360 JSR sterr
13370 LDX #183
13380 LDY #14
13390 JMP err
13400 :
13410 .spliterr2
13420 JSR sterr
13430 LDX #223
13440 LDY #23
13450 JMP err
13460 :
13470 .diserr
13480 JSR syntax
13490 LDA temp5
13500 BNE diserr1
13510 LDX #90
13520 LDY #41
13530 JMP err
13540 .diserr1 CMP #1
13550 BNE diserr2
13560 LDX #131
13570 LDY #22
13580 JMP err
13590 .diserr2 LDX #153
13600 LDY #30
13610 JMP err
13620 :
13630 .transfer
13640 JSR param3
13650 LDX #10
13660 JSR disc
13670 BEQ trans1
13680 JMP errdis
13690 .trans1 RTS
13700 .blankbuf
13710 LDA #0
13720 TAY
13730 .blan1 STA
      buffer,Y
13740 STA buffer+256,Y
13750 INY
13760 BNE blan1
13770 RTS
13780 :
13790 .errdis
13800 JSR sterr
13810 LDX #197
13820 LDY #15
13830 JMP err
13840 :
20765 OPT FNequb(&D)
```

See 'Beeb Forum', page 115

Listing 1. Double-width character routine from Jonathan Temple

```
   10 REM Double width chrs.
   60 PROCassemble
   70 FOR mode=0 TO 6
   80 MODE mode
   90 VDU 19,1,2;0;
  100 PROCdouble(0,5,1,"Double wid
th")
  110 PROCdouble(0,7,1,"in Mode "+
STR$(mode))
  120 Q=INKEY(250)
  130 NEXT
  140 END
10000 DEFPROCassemble
10010 char1=&CF0
10020 char2=&CF8
10030 osword=&FFF1
10040 FOR pass=0 TO 2 STEP 2
10050 P%=&A00
10060 [OPT pass
10070 STX parblock
10080 LDA #10
10090 LDX #parblock MOD 256
10100 LDY #parblock DIV 256
10110 JSR osword
10120 LDX #7
10130 .row
```

Continued ▶

Listing 2. Simon Reading's mini-compiler

```
   10 REM Extend - Basic Compiler
   20 VDU15
   30 *OPT3,6:REM delete for DFS use
   40 PROCkey:A%=&1900:GOTO130:
   50 VDU6
   60 *FX13,2
   70 FOR A=&C00 TO &CFF
   80 IF ?A=ASC"{" A=A+1:A$="":REPEAT:A$=A
$+CHR$?A:A=A+1:UNTIL ?A=ASC"}":B$=RIGHT$(A
$,LENA$-1):C=ASC(LEFT$(A$,1)):L=(C?&8351)*
256+(C?&82DF):PROCass
   90 NEXT
  100 PRINT"ERROR"
  110 *FX13,2
  120 END
  130 CLS:PRINT''CHR$141;" ENTER BASIC LI
NE PLEASE"'CHR$141;" ENTER BASIC LINE PLEA
SE"''"  :_";
  140 VDU21
  150 OSCLI"KEY9PA.=&C00|MNEW|M15{|F"
  160 OSCLI"KEY0}|MPA.="+STR$(A%)+"|MOLD|M
GOTO60|M"
  170 *FX138,0,137
  180 END
  190 DEFPROCass
  200 FOR A=0 TO 2 STEP2
  210 P%=&E00
  220 [OPT A
  230 .filename
  240 EQUS B$
  250 EQUB 13
  260 .start
  270 LDX #0
  280 .loop
  290 LDA filename,X
  300 STA &700,X
  310 INX
  320 CPX #LENB$+2
  330 BNE loop
  340 LDA #0
  350 STA &A
  360 STA &B
  370 LDA #&7
  380 STA &C
  390 JSR L
  400 RTS
  410 .end
  420 ]
  430 NEXT
  440 PROCequb
  450 ENDPROC
  460 DEFPROCkey
  470 FOR A=0 TO 2 STEP2
  480 P%=&1000
  490 [OPTA
  500 PHP:PHA:TXA:PHA
  510 TYA:PHA
  520 CPY #&D
  530 BNE restore
  540 LDA #138
  550 LDX #0
  560 LDY #128
  570 JSR &FFF4
  580 .restore
  590 PLA:TAY:PLA:TAX
  600 PLA:PLP
  610 RTS
  620 ]
  630 NEXT
  640 ?&220=0
  650 ?&221=&10
  660 *FX14,2
  670 ENDPROC
  680
  690 DEFPROCequb
  700 *FX21,0
  710 CLS:PRINT'''
  720 INPUT"Do you wish to *SPOOL file (Y/
N)";A$:IF A$<>"Y" END
  730 INPUT'"Type in the filename "A$
  740 INPUT'"What line do you wish to star
t at "line
  750 INPUT'"What line increment do you wa
nt   "inc
  760 IF line=0 line=1000
  770 CLS:PRINT'''
  780 PRINT"Filename ";CHR$34;A$;CHR$34
  790 PRINT'"1st line no.";line
  800 PRINT'"Line steps of ";inc'
  810 OSCLI"SPOOL "+A$
  820
  830 PRINTline;".filename":line=line+inc
  840 FOR A=&C00 TO &CFF
  850 IF ?A<>ASC"{" NEXT
  860 A=A+2
  870 PRINTline;"EQUB &";~?A:line=line+inc
  880 IF A?1=ASC"}" THEN 900 ELSE A=A+1:GO
TO870
  890 NEXT
  900 PRINTline;"EQUB &D"
  910 line=line+inc:PRINTline;".";A$
  920 line=line+inc:PRINTline;"LDX #0"
  930 line=line+inc:PRINTline;".loop"
  940 line=line+inc:PRINTline;"LDA filenam
e,X"
  950 line=line+inc:PRINTline;"STA &700,X"
  960 line=line+inc:PRINTline;"INX"
  970 line=line+inc:PRINTline;"CPX #";LENB
$+2
  980 line=line+inc:PRINTline;"BNE loop"
  990 line=line+inc:PRINTline;"LDA #0"
 1000 line=line+inc:PRINTline;"STA &A"
 1010 line=line+inc:PRINTline;"STA &B"
 1020 line=line+inc:PRINTline;"LDA #7"
 1030 line=line+inc:PRINTline;"STA &C"
 1040 line=line+inc:PRINTline;"JSR &";~L
 1050 line=line+inc:PRINTline;"RTS"
 1060 *SPOOL
```

See 'On the Menu', page 142

Listing 1. Peter Rochford's program to give an automatic menu of the contents of a disc

Second processor notes

The disc menu program will run quite happily on the 6502 second processor, with the following two changes:

```
310 PAGE=&800
370 PAGE=&800
```

```
   10 REM Disc menu and status
   20 REM by Peter L. Rochford
   30 REM For BBC+DFS, 6502 SP
   40 REM (c) Acorn User - July 1985
   50 :
   60 ON ERROR PROCerror:END
   70 C%=FALSE
   80 *FX 4,1
   90 REM IMPORTANT! See text about foll
owing line.
  100 *FX 200,3
  110 MODE 7
  120 VDU 23,1,0;0;0;0;
  130 DIM W$(31),C 10,J% 10
  140 J%?0=0:T%=&7A00:E%=&7900
  150 PROCmainprog
  160 :
  170 REPEAT
  180 A%=GET
  190 IF A%>47 AND A%<52 THEN CLS:J%?0=A
%-48:PROCdrive:PROCmainprog
  200 IF A%=16 THEN PROCprint
  210 IF A%=17 THEN *FX210,1
  220 IF A%=3 AND S%=TRUE THEN PROCshow
  230 UNTIL A%>64 AND A%<Z%+65
  240 CLS
  250 VDU 23,1,1;0;0;0;
  260 *DIR =
  270 *FX 4,0
  280 *FX 200,0
  290 IF LEFT$(W$(A%-64),1)=CHR$(173AND&
7F) THEN GOTO 340
  300 REM Set Page as DFS default
  310 PAGE=&1900
  320 CHAIN W$(A%-64)
  330 END
  340 $C=W$(A%-64)
  350 X%=C MOD 256:Y%=C DIV 256
  360 REM Set Page as DFS default
  370 PAGE=&1900
  380 CALL &FFF7
  390 END
  400 :
  410 DEF PROCmainprog
  420 PROCreadsectors
  430 PROCdisctitle
  440 PROCgetfiles
  450 PROCdisplayfiles
  460 PROCdiscstatus
  470 *FX 21,0
  480 ENDPROC
  490 :
  500 DEF PROCreadsectors
  510 J%!1=E%:J%?5=3:J%?6=&53:J%?7=0:J%?
8=0:J%?9=&22
  520 A%=&7F
  530 X%=J% MOD 256:Y%=J% DIV 256
  540 CALL &FFF1
  550 IF J%?10<>0 THEN C%=TRUE:PROCerror
:END
  560 ENDPROC
  570 :
  580 DEF PROCdisctitle
```

Continued ▶

◀ Continued

```
10140 LDA #0
10150 STA char1,X
10160 STA char2,X
10170 LDY #7
10180 .column
10190 LDA parblock+1,X
10200 AND bit,Y
10210 BEQ notpixel
10220 TXA
10230 PHA
10240 CLC
10250 ADC offset,Y
10260 TAX
10270 LDA char1,X
10280 ORA value,Y
10290 STA char1,X
10300 PLA
10310 TAX
10320 .notpixel
10330 DEY
10340 BPL column
10350 DEX
10360 BPL row
10370 RTS
10380 ]
10390 parblock=P%
10400 bit=P%+10
10410 offset=P%+18
10420 value=P%+26
10430 NEXT
10440 FOR pos=0 TO 23
10450 READ bit?pos
10460 NEXT
10470 ENDPROC
10480 :
10490 DATA 1,2,4,8,16,32,64,128
10500 DATA 8,8,8,8,0,0,0,0
10510 DATA 3,12,48,192,3,12,48,192
10520 :
10530 DEFPROCdouble(X,Y,C,T$)
10540 LOCAL X%,L%
10550 COLOUR C
10560 FOR L%=1 TO LEN(T$)
10570 X%=ASC(MID$(T$,L%,1))
10580 CALL &A00
10590 VDU 31,X+(L%-1)*2,Y,254,255
10600 NEXT
10610 ENDPROC
```



◄ Continued

```
590 D$=""
600 FOR L%=E% TO E%+7
610 D$=D$+CHR$(?L%)
620 NEXT L%
630 FOR L%=T% TO T%+3
640 D$=D$+CHR$(?L%)
650 NEXT L%
660 IF ASC(D$)=0 THEN D$="No Disc Titl
e"
670 PRINT TAB(1,0);CHR$(148);STRING$(3
8,"s")
680 FOR I%=1 TO 2
690 PRINT TAB(0,I%);CHR$(141);CHR$(134
);CHR$(157);CHR$(132);TAB(20-LEN(D$)/2,I
%);D$
700 NEXT I%
710 PRINT TAB(1,3);CHR$(148);STRING$(3
8,"s")
720 ENDPROC
730 :
740 DEF PROCgetfiles
750 F%=T%?5 DIV 8
760 Z%=0
770 FOR I%=1 TO F%
780 F$=CHR$(?(E%+I%*8)MOD128)
790 L$=CHR$(?(E%+I%*8+8-1)AND&7F)
800 IF ASC(L$)=0 L$=CHR$(36)
810 P$=L$+"."+F$
820 FOR W%=E%+I%*8+1 TO E%+I%*8+8-2
830 P$=P$+CHR$(?W%)
840 NEXT W%
850 IF LEFT$(P$,1)=CHR$(171AND&7F) OR
LEFT$(P$,1)=CHR$(173AND&7F) THEN Z%=Z%+1
:W$(Z%)=P$
860 NEXT I%
870 ENDPROC
880 :
890 DEF PROCdisplayfiles
900 IF Z%=0 PRINT TAB(2,10);CHR$(134);
"No menufiles on the disc in";CHR$(135);
"Drive ";J%?0;TAB(6,14);CHR$(134);"Pleas
e select another Drive,";TAB(8,16);CHR$(
134);"or press BREAK to exit":ENDPROC
910 FOR I%=1 TO Z% STEP 2
920 PRINT TAB(7);CHR$(134);CHR$(I%+64)
;" ";CHR$(135);RIGHT$(W$(I%),LEN(W$(I%))
-2);:IF I%<=Z%-1 THEN PRINT TAB(23);CHR$
(134);CHR$(I%+65);" ";CHR$(135);RIGHT$(W
$(I%+1),LEN(W$(I%+1))-2)
930 NEXT I%
940 ENDPROC
950 :
960 DEF PROCdiscstatus
970 IF Z%=0 ENDPROC
980 S%=FALSE
990 M%=T%?&F:N%=T%?&E:B%=T%?&D:P%=T%?&
C
1000 U%=(N% AND 3)*256+M%+(N% AND &30)*
16+B%-(P%<>0)
1010 K%=&200:H%=T%+T%?5
1020 REPEAT
1030 IF ?(H%+4)<>0 THEN Q%=&100 ELSE Q%
=0
1040 Q%=Q%+256*?(H%+5)+256*16*(?(H%+6)
AND &30)
1050 K%=K%+Q%:H%=H%-8
1060 UNTIL H%=T%
1070 V%=256*(T%?6 AND 3)+T%?7-U%
1080 PRINT TAB(1,20);CHR$(148);STRING$(
38,"s")
1090 PRINT TAB(1,21);CHR$(134);CHR$(157
);CHR$(132)
1100 IF U%-(K% DIV 256)>0 THEN S%=TRUE:
PRINT TAB(3,21);CHR$(148);CHR$(136);"$";
1110 PRINT TAB(6,21);CHR$(137);CHR$(132
);"Status of Disc in Drive ";J%?0
1120 PRINT TAB(1,22);CHR$(134);CHR$(157
);CHR$(132);" Bytes free:";V%*256;TAB(24
,22);"Files free:";31-F%;
1130 PRINT TAB(1,23);CHR$(148);STRING$(
38,"s");
1140 ENDPROC
1150 :
1160 DEF PROCdrive
1170 $C="DRIVE"+STR$(A%-48)
1180 X%=C MOD 256:Y%=C DIV 256
1190 CALL &FFF7
1200 ENDPROC
1210 :
1220 DEF PROCshow
1230 PRINT TAB(4,24);CHR$(134);"Bytes r
eleased by *COMPACT:";(U%-(K% DIV 256))*
256;
1240 TIME=0
1250 REPEAT UNTIL TIME=300
1260 PRINT TAB(0,24);SPC(38);
1270 ENDPROC
1280 :
1290 DEF PROCprint
1300 *FX 3,10
1310 VDU 27,69,14
1320 PRINT D$
1330 VDU 27,70,15
1340 PRINT STRING$(47,"-")
1350 FOR I%=1 TO Z%
1360 PRINT RIGHT$(W$(I%),LEN(W$(I%))-2)
;"    ";
1370 IF I% MOD 5=0 THEN PRINT
1380 NEXT I%
1390 PRINT'STRING$(47,"-")
1400 PRINT"Bytes free: ";V%*256;SPC(15)
;"Files free: ";31-F%'
1410 VDU 18
1420 *FX 3,0
1430 ENDPROC
1440 :
1450 DEF PROCerror
1460 ON ERROR OFF
1470 *FX 3,0
1480 *FX 4,0
1490 *FX 200,0
1500 VDU 22,7
1510 IF C%=TRUE THEN PRINT;CHR$(130);"D
isk Error ";J%?10:ENDPROC
1520 REPORT:PRINT" at line ";ERL
1530 ENDPROC
```

See 'Break Away', page 145

Listing 1. Mark Dove's program will close files left open on disc if you accidentally press the Break key

```
   10 REM Close Files on Break
   20 REM by Mark Dove
   30 REM for BBC and 6502 SP
   40 REM (c) Acorn User July 1985
   50 :
   60 IF PAGE<>&2000:PAGE=&2000:CHAIN"SO
URCE"
   70 DIM X% 50
   80 Z%=&900
   90 PROCassemble
  100 PROCcheck
  110 INPUT''"Filename for machine code:
 "A$
  120 A$="SAVE "+A$+" "+STR$~Z%+" "+STR$
~P%+" "+STR$~(&FFFF0000+Z%)+" "+STR$~(&F
FFF0000+Z%)
  130 PROCoscli(A$)
  140 END
  150 :
  160 DEFPROCassemble
  170 osfind=&FFCE
  180 osbyte=&FFF4
  190 filev=&212
  200 FOR OP=0 TO 3 STEP 3
  210 P%=Z%
  220 [OPT OP
  230 .init LDY#13
  240 .savevec
  250 LDAfilev,Y
  260 STA spare,Y
  270 DEY
  280 BPL savevec
  290 LDA #247
  300 LDX #76
  310 LDY #0
  320 JSR osbyte
  330 LDA #248
  340 LDX #(close MOD256)
  350 LDY #0
  360 JSR osbyte
  370 LDA #249
  380 LDX #(close DIV256)
  390 LDY #0
  400 JSR osbyte
  410 RTS
  420 .spare:]
  430 P%=P%+14
  440 [OPT OP
  450 .close
  460 BCC first
  470 RTS
  480 .first
  490 LDY #13
  500 .replace
  510 LDA spare,Y
  520 STA filev,Y
  530 DEY
  540 BPL replace
  550 LDA #247
  560 LDX #0
  570 LDY #0
  580 JSR osbyte
  590 LDA #&FF
  600 TAY
  610 LDX #0
  620 JSR osbyte
  630 TXA
  640 AND #&30
  650 LSR A
  660 LSR A
  670 STA &B0
  680 LSR A
  690 ADC &B0
  700 TAY
  710 JSR fdc
  720 LDY #24
  730 LDX #3
  740 .next
  750 JSR fdc
  760 DEX
  770 BNE next
  780 LDY #0
  790 TYA
  800 JMP osfind
  810 .fdc
  820 LDA data,Y
  830 .wait
  840 BIT &FE80
  850 BMI wait
  860 STA &FE80
  870 INY
  880 .param
  890 LDA data,Y
  900 INY
  910 CMP #&EA
  920 BNE more
  930 RTS
  940 .more
  950 PHA
  960 .busy
  970 LDA &FE80
  980 AND #&20
  990 BNE busy
 1000 PLA
 1010 STA &FE81
 1020 JMP param
 1030 .data
 1040 ]
 1050 PROCcommand(&35,&D,2,8,&C0)
 1060 PROCcommand(&35,&D,3,8,&C0)
 1070 PROCcommand(&35,&D,3,25,&C4)
 1080 PROCcommand(&35,&D,12,10,&C8)
 1090 PROCcommand(&35,&10,255,255,0)
 1100 PROCcommand(&35,&18,255,255,0)
 1110 PROCcommand(&3A,&17,&C1,&EA,0)
 1120 NEXT
 1130 ENDPROC
 1140 :
 1150 DEFPROCcommand(A%,B%,C%,D%,E%)
 1160 ?P%=A%
 1170 P%?1=B%
 1180 P%?2=C%
 1190 P%?3=D%
 1200 P%?4=E%
 1210 P%?5=&EA
 1220 P%=P%+6
 1230 ENDPROC
 1240 :
 1250 DEFPROCoscli(A$)
 1260 $X%=A$:Y%=X%DIV256
 1270 CALL&FFF7
 1280 ENDPROC
 1290 :
 1300 DEF PROCcheck
 1310 LOCAL X%, Y%
 1320 X%=0
 1330 FOR Y%=&900 TO &995
 1340 X%=X%+?Y%
 1350 NEXT Y%
 1360 IF X%=19275 THEN ENDPROC
 1370 PRINT "Checksum error"
 1380 END
```

See 'Speed Reading', page 147

Listing 1. Creates string files for use with listing 2

```
   10 REM Sample data file creation
   20 REM By Nick Davies
   30 REM for BBC Micro
   40 REM (c) Acorn User July 1985
   50 :
   60 MODE7
   70 INPUT ''"Please Enter Name of File
 " fil$
   80 INPUT ''"How many records " recs%
   90 N%=OPENOUT(fil$)
  100 IF N%=0 THEN PRINT'"ERROR - failed
 to open file":END
  110 FOR I%=1 TO recs%
  120 PRINT #N%,"Test Data String Number
 "+STR$(I%)
  130 NEXT
  140 CLOSE #N%
  150 PRINT''STR$(recs%);" strings have
 been written to ";fil$
  160 END
```

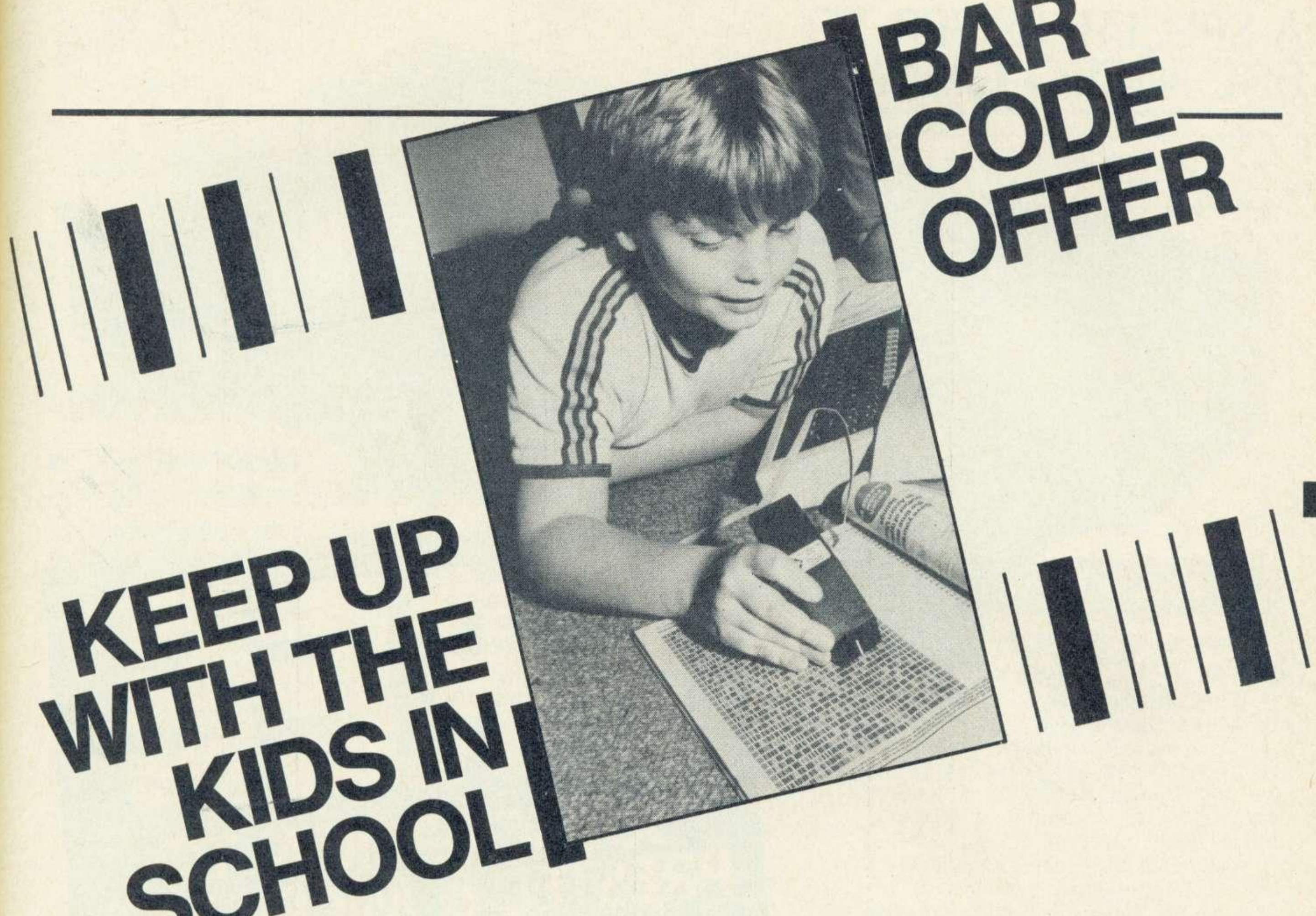
Listing 2. Demonstrates the improvements in speed made by the procedures

```
   10 REM Read input file/write new file
   20 REM by Nick Davies
   30 REM for BBC Micro
   40 REM (c) Acorn User July 1985
   50 :
   60 MODE7
   70 REPEAT
   80 PRINT ''"Fast or Slow"
   90 G$=GET$
  100 UNTIL G$="F" OR G$="S"
  110 FAST=FALSE
  120 IF G$="F" THEN FAST=TRUE
  130 INPUT''"Please Enter Input File "
 infil$
  140 N%=OPENIN(infil$)
  150 IF N%=0 THEN PRINT"Failed to open
 input file":END
  160 INPUT''"Please Enter Output File "
 outfil$
  170 IF FAST THEN O%=FN_VOPENOUT(outfil
$,30,100) ELSE O%=OPENOUT(outfil$)
  180 IF O%=0 THEN PRINT"Failed to open
 output file":CLOSE#0:END
  190 TIME=0
  200 I%=0
  210 REPEAT
  220 I%=I%+1
  230 INPUT#N%,A$
  240 IF FAST THEN PROC_VPRINT(O%,A$) EL
SE PRINT#O%,A$
  250 UNTIL EOF#N%
  260 IF FAST THEN PROC_VCLOSE(O%) ELSE
 CLOSE#O%
  270 CLOSE#N%
  280 PRINT"That took ";INT(TIME/100);"
 seconds to transfer ";I%;" strings from
 ";infil$;" to ";outfil$;" using the ";
  290 IF FAST THEN PRINT"new procedures"
 ELSE PRINT"standard BASIC file handling
"
  300 END
  310 :
10000 DEFFN_VOPENOUT(fil$,reclen%,numrec
s%)
10001 REM parameters are:
10002 REM fil$ - filename
10003 REM reclen% -maximum string length
10004 REM numrecs% - number of strings t
o hold in buffer
10010 numrec%=numrecs%
10020 LOCAL i%,h%
10030 recptr%=0
10040 DIM buffer$(numrec%)
10060 FOR i%=1 TO numrec%
10070 buffer$(i%)=STRING$(reclen%," ")
10080 buffer$(i%)=""
10090 NEXT
10100 h%=OPENOUT(fil$)
10110 =h%
10120 DEFPROC_VPRINT(h%,a$)
10121 REM parameters are:
10122 REM h% - file handle
10123 REM a$ - string to be written
10130 LOCAL i%
10140 recptr%=recptr%+1
10150 buffer$(recptr%)=a$
10160 IF recptr%<numrec% THEN ENDPROC
10170 FOR i%=1 TO numrec%
10180 PRINT#h%,buffer$(i%)
10190 NEXT
10200 recptr%=0
10210 ENDPROC
10220 DEFPROC_VCLOSE(h%)
10230 IF recptr%=0 THEN CLOSE#h%:ENDPROC
10231 REM parameters are:
10232 REM h% - file handle
10240 LOCAL i%
10250 FOR i%=1 TO recptr%
10260 PRINT#h%,buffer$(i%)
10270 NEXT
10280 CLOSE#h%
10290 ENDPROC
```

See 'B+ Grading', page 160

Listing 1. Enter the listing as shown, correcting any mistakes that are flagged when the program is run. Once the program is correct, the machine code generated by the assembler will be saved under the filename XWORD. To use the patch simply turn on the BBC B+ and type *XWORD. The patch will load, run and then select *View*. The shadow memory may now be initialised with *SHADOW and used without problem.

```
10 REM View 2.1 Patch
20 REM for BBC B+ and View 2.1
30 REM (c) Acorn User July 1985
40 DIM MC%&100
50 xjmp=&4C
60 xshadow=&72:
70 xreadhiorder=&82
80 xreadscreensize=&85
90 xreadresettype=&FD
100 osbyte=&FFF4:oscli=&FFF7
110 bytevec=&20A
120 codestart=&FFFF0C00
130 FOR I%=4 TO 6 STEP 2
140 O%=MC%
150 P%=codestart
160 [OPT I%
170 .setup
180 JSR setupvecs
190 LDA #xshadow
200 LDX #0
210 JSR osbyte
220 LDX #FNLO(word)
230 LDY #FNHI(word)
240 JMP oscli
250 .resetsetup
260 BCC notthistime
270 LDA #xreadresettype
280 LDX #0
290 LDY #&FF
300 JSR osbyte
310 TXA
320 BEQ setupvecs
330 LDA #247
340 LDX #0
350 JMP osbyte0
360 .setupvecs
370 PHP
380 SEI
390 LDX #1
400 .checkloop
410 LDA bytevec,X
420 CMP newbytevec,X
430 BNE notalreadysetup
440 DEX
450 BPL checkloop
460 BMI alreadyinstalled
470 .notalreadysetup
480 LDX #1
490 .setuploop
500 LDA bytevec,X
510 STA oldbytevec,X
520 LDA newbytevec,X
530 STA bytevec,X
540 DEX
550 BPL setuploop
560 .alreadyinstalled
570 LDA #248
580 LDX #FNLO(resetsetup)
590 JSR osbyte0
600 LDA #249
610 LDX #FNHI(resetsetup)
620 JSR osbyte0
630 LDA #247
640 LDX #xjmp
650 JSR osbyte0
660 PLP
670 .notthistime
680 RTS
690 .newbyte
700 CMP #xreadscreensize
710 BNE notscreensize
720 PHA
730 TXA
740 AND #7
750 TAX
760 LDY himemtable,X
770 LDX #0
780 PLA
790 RTS
800 .notscreensize
810 CMP #xreadhiorder
820 BNE notourbyte
830 LDX #0
840 LDY #0
850 RTS
860 .notourbyte
870 JMP (oldbytevec)
880 .osbyte0
890 LDY #0
900 JMP osbyte
910 .himemtable
920 EQUB &30
930 EQUB &30
940 EQUB &30
950 EQUB &40
960 EQUB &58
970 EQUB &58
980 EQUB &60
990 EQUB &7C
1000 .word
1010 EQUS "WORD"+CHR$13
1020 .newbytevec
1030 EQUW newbyte
1040 .codeend
1050 .oldbytevec
1060 EQUW 0
1070 ]:NEXT
1080 realend=codeend+MC%-(codestart AND &FFFF)
1090 OSCLI"S.XWORD "+STR$~MC%+" "+STR$~realend+STRING$(2," "+STR$~codestart)
1100 END
1110 :
1120 DEFFNLO(X)=X AND 255
1130 DEFFNHI(X)=(X AND &FF00)DIV 256
1140 DEFPROCSAVE OSCLI"S.XWDSC "+STR$~PAGE+" "+STR$~TOP:ENDPROC
```



BAR CODES will revolutionise the way we use computers in applications as well as the way we load data. Here is the chance to get experience of this important development by ordering the Addison Wesley/MEP Bar Code Teaching Pack (see our January issue, page 129) direct through *Acorn User*.

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Acorn User will be printing some listings in bar code format in each issue and making booklets of bar codes available by mail order.

Book publishers are already printing listings in bar code format, in fact Bruce Smith's latest book *The BBC Micro Machine Code Portfolio* has 13 pages of bar code listings.

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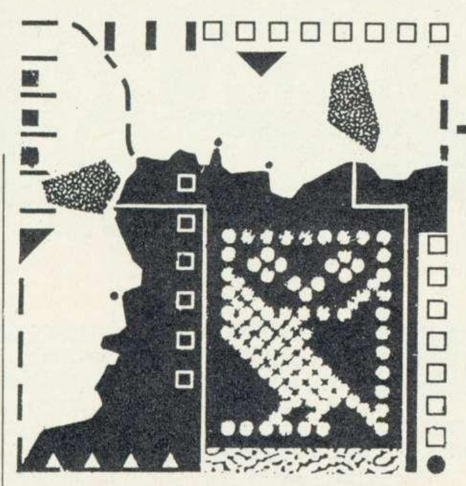
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Produce double width characters, an ultra-small Basic compiler and a binary to decimal conversion utility – Bruce Smith passes on your routines

£10 Double width display

BOB Tinley's program 'Slim characters in mode 2' presented in the April issue of *Acorn User* has prompted 13-year-old Jonathan Temple from Nottingham to perform the reverse operation to produce double width characters in modes 0 to 6 (listing 1). Jonathan provides the details. . . .

This program is useful, say, in having readable text in mode 0 along with the hi-res graphic display, or for a bold title in mode 1. The routine given works in all graphic modes, 0-6.

To use the routine, include PROCassemble near the end of your program, and a line such as:

```
10 PROCassemble
```

near the start. Now to print double width text, use:

```
PROCdouble (X,Y,C,T$)
```

where X and Y are the position of the text, C is the colour, and T$ is the text to be printed. A short demonstration program is included to show you the results in various modes.



Mini Basic compiler

COMPILERS are always the favourite toys of the real computer buffs, and we've carried two in recent issues of *Acorn User* – a graphics compiler and a sound compiler. This month Simon Reading of Gravesend takes the next step and provides us with an ultra-small Basic compiler!

Simon's program is written for Basic 2 and takes advantage of the interpreter itself. It should be possible to rework the program for Basic 1 by replacing the OSCLI statements with a suitable emulation PROC. The compiler will convert a Basic line into a machine code routine, and may include high level statements such as the old machine code bogeys SIN, COS, INSTR, EVAL, etc . . .

The compiler works a line at a time. Lines may be multi-statement, and each line can be *SPOOLED to tape or disc, so that long programs can be built up as a series of *EXEC files. Use the program as follows:

```
MODE 7
PAGE = &1900
NEW
CH. "EXTEND"
```

When the program is loaded you will be prompted to input your Basic line. Enter this and press Return. You will then be prompted to see if you wish to save the machine code as a *SPOOL file, so tap the Y key and enter the start and increment line numbers. The program will then be *SPOOLed and can subsequently be *EXECed back.

The following *SPOOL file was created using the program for a simple Basic line:

```
PRINT "Acorn User", CHR$7
```

All you now need to do to use this program is add a few lines thus:

```
10 P% = &C00
20 [
450 ]
```

and then a CALL to your filename address:

```
CALL AU
```

The mini-compiler works by converting your Basic line of text to EQUB values. When the code is called these bytes are read and placed into the input line buffer and a subroutine call into the ROM line interpreter performed to 'execute' the Basic line.

The machine code does become rather repetitive – but I'm sure you'll have many enhancements and comments to make so let's see them!

£5 Conversion utility

A USEFUL little utility that sets up function key 0 to perform binary to decimal and decimal to binary conversions for you has been sent in by Toby Jones of London. Toby explains . . .

One of the many advantages of this program (below) is that it does not delete the program resident in the RAM, and it does not need to be reloaded from tape to be re-used.

Once the key has been defined, it can be saved as usual by saving the soft-key memory space below PAGE, ie:

```
*SAVE BDC 0B00 + FF
```

It can then be loaded while a program is resident in the RAM and will not corrupt it. This is achieved by typing:

```
*LOAD BDC
```

To use the function, hit f0. The message 'BD + NUM' will appear. Now, type in a short string, the first character of which is either a B (ie, 'this is a binary number to be converted to decimal') or a D (ie, 'this is a decimal number to be converted to binary'). Then you type in your binary or decimal number and hit Return. Any spaces are disregarded by the function.

The answer will have a B or D on the front, followed by the converted number. For example:

```
BD + NUM
?B10011000 (–number to be
converted–binary)
D152 (–answer–decimal)
?D221 (–number to be converted–
decimal)
B11011101 (–answer–binary)
```

Pressing Escape leaves the function and returns to the '>' prompt.

```
   10*K.O P."DB+NUM"':REP.I.A$:X=1:Y=0:IFLE.A$,1)=
"D"TH.Y=VALRI.A$,LENA$-1):REP.X=X*2:U.X>Y:X=X/2:P.
" B";:REP.Z=-(X<=Y):P.;Z;:Y=Y-X*Z:X=X/2:U.X<1:P.':
U.FA. EL.F.I=LENA$TO2S.-1:Y=Y+X*VALM.A$,T.1):X=X*(
2+(M.A$,T,1)=" ")):N.:P." D";Y':U.FA.|L|M
```

You'll find Beeb Forum listings 1 and 2 on yellow page 107

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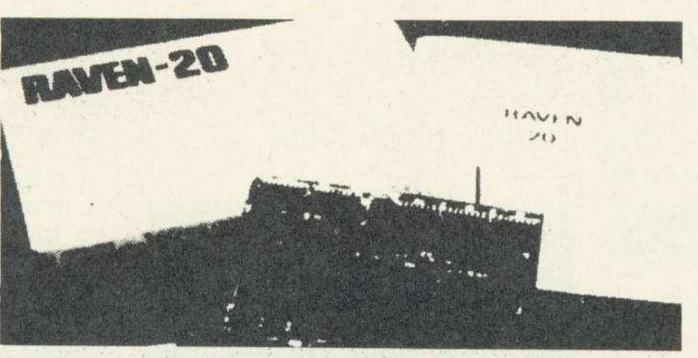
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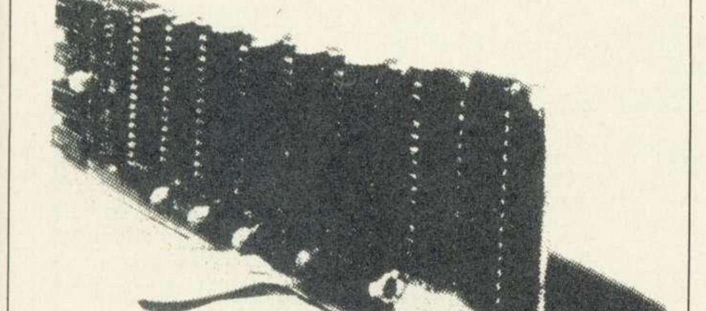
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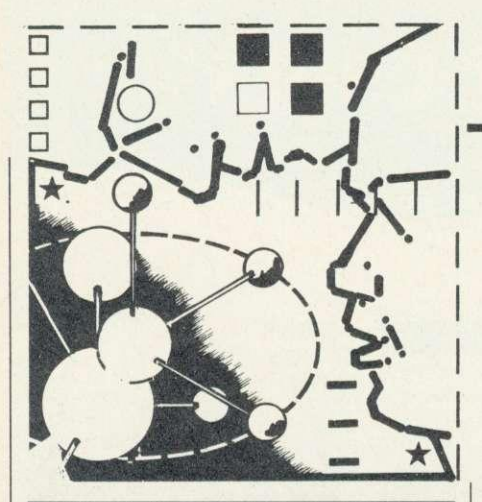
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Another host of Atomic hints presented by Mike Barwise

Successful saving

A SIGNIFICANT omission from the Atom cassette operating system is the facility to verify the success of a SAVE to tape without corrupting the source file. Even reloading a saved program to another area of memory is not a guaranteed check, as the cumulative checksum can let through data errors which cancel within a block.

This problem is very neatly solved for programs in Basic by a routine from Richard Gledhill of Oxfordshire. Richard's routine consists of 146 bytes of machine code which can be assembled to any area not occupied by the program to be verified. It compares a named file on tape with the contents of the memory pointed to by the file block headers, and displays the memory address of any byte which does not match.

The routine allows three discrepancies to be flagged within any one block before it terminates with a 'bad tape' message. As it uses the BGTVEC to read the file from tape, it should work with most of the toolbox COS modifications. The end of the tape file is identified by reading the bytes #0D, #FF (the end of Basic textspace marker), and therefore should only be used to verify machine code files if these two bytes have been appended to the end of the file during writing. Basic programs with machine code at the end will terminate the verify without checking the machine code. Richard's verify routine (listing 1) should be entered by a link to the first byte, eg, LINK #2800 for the assembler listing given here.

Weak link exposed

RICHARD Gledhill's verify routine brings to mind a point many of you have commented on – the apparent unreliability of the Atom cassette interface. After much investigation, I have established the weak link to be most often the cassette machine itself. The interface is inherently reliable enough to be cross connected between two Atoms for data transfer between them without

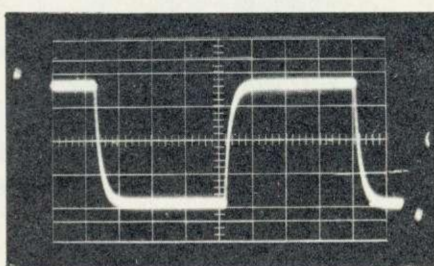


Figure 1. Output from the cassette port

a significant error rate. The Atom is remarkably tolerant of signal quality for an interface of such simple hardware.

The major problem is that some cassette recorders reproduce signals you wouldn't recognise if you found them in your soup. Remember, most cheap cassette machines (under £200) and all ordinary interconnect leads are designed for playback of mass production music, where hum, rumbles, hiss and frequency variations go largely unnoticed. The Atom, however, can ignore nothing: it can only misinterpret what it notices.

Figures 1 to 4 are oscilloscope trace photos of thirty second samples of the Atom high tone (2.4KHz) leader. The 'scope has been synchronised to display one cycle of the tone. All 'scope and cassette machine settings are constant throughout so that direct comparisons may be made. The traces are read like graphs, with time along the horizontal and voltage along the vertical axes. The width of the trace in all cases is proportional to the signal jitter (the maximum deviation between the 72,000 cycles of the tone that are superimposed on each trace). Jitter in the vertical plane (width of horizontal trace) indicates variation in signal strength (voltage) and horizontal jitter (width of vertical trace) indicates frequency variation due to timing variations in the Atom and tape speed variations.

Figure 1 is a trace of the output direct from the Atom cassette port. It's a stable square wave, give or take slightly rounded corners, and although there is voltage fluctuation (vertical

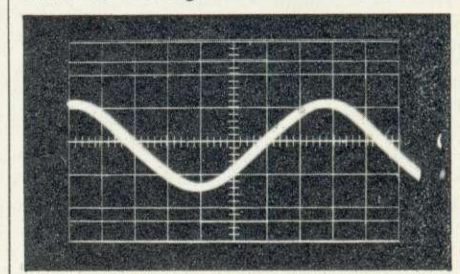


Figure 2. Output from a good data recorder

jitter) of about eight per cent of the signal voltage swing, this is well within acceptable limits. The vertical trace is extremely fine, indicating excellent timing and frequency stability (absence of horizontal jitter). It's important to note that the horizontal distance (time) between the falling and rising (centre of

```
10 REM VERIFY
20 REM BY RICHARD GLEDHILL
30 REM FEBRUARY 1985
40 DIMLL9
50 F.N=0TO9;LLN=-1;N.
60 P.$21
70 F.N=1TO2
80 P=£2800
90 [
100 :LL0 LDA@0 \INITIALISE
110 STA£99
120 JSR£FC4F \PLAY TAPE
130 :LL1 LDA@0 \ZERO LAST
140 STA£9A \BYTE STORE
150 LDX@4
160 :LL2 JSR£FFD4 \FIND HEADER
170 CMP@42
180 BNELL2
190 DEX
200 BNELL2 \?4 *'S
210 :LL3 JSR£FFD4 \LOOK FOR
220 CMP@£D \END OF TITLE
230 BNELL3
240 :LL4 JSR£FFD4 \STORE REST OF
250 STA£90,X \HEADER DATA
260 INX
270 CPX@8
280 BNELL4
290 LDA£96 \SHIFT IT ROUND
300 STA£91
310 LDA£97
320 STA£90
330 LDA£92 \CHECK BLOCK NO.
340 CMP£99
350 BNELL9
360 LDA@£D \PRINT CURRENT
370 JSR£FFF4 \BLOCK NO.
380 LDA£92
390 JSR£F7FA
400 LDY@0
410 :LL5 JSR£FFD4 \VERIFY PROGRAM
420 CMP(£90),Y
430 BNELL7 \?ERROR
440 CPY£93 \?END OF BLOCK
450 BEQLL6
460 STA£98 \SAVE LAST BYTE
470 INY
480 BNELL5
490 :LL6 LDY@3 \RESET ERROR COUNT
500 STY£9A
510 INC£99 \INC BLOCK NO
520 CMP@£FF \?END OF PROGRAM
530 BNELL1  \LOOK FOR £0D
540 LDA£98  \FOLLOWED BY £FF
550 CMP@£D
560 BNELL1
570 JSR£F7D1 \FINAL MESSAGE
580];$P="OK"
590 P=P+LENP;[
600 NOP
610 RTS
620 :LL7 TYA \SET UP ERROR
630 CLC \LOCATION FOR PRINTING
640 ADC£90
650 STA£90
660 BCCLL8
670 INC£91
680 :LL8 JSR£FD1A \BEEP
690 LDX@£90
700 JSR£F7F1 \PRINT ERROR LOCATION
710 DEC£9A \DEC ERROR COUNTER
720 BNELL9
730 JSR£F7D1 \THIRD ERROR
740];$P="BAD TAPE"
750 P=P+L
```

Listing 1. Richard Gledhill's routine to verify that a program has been saved to tape

the figure) edges of the wave is practically the same as the distance between the rising and falling (right-hand) edges. This is referred to as a mark/space ratio of 1:1.

A square wave cannot be recorded on a magnetic tape. The nearest approximation is a triangular wave. Figure 2 shows the output from a good average-price data recorder replaying a tape of the signal in figure 1. The signal is not a perfect triangular wave due to the response of the automatic level control in the cassette recorder (more about this later), but it is even and exhibits very consistent and minimal jitter, and has a mark/space ratio of effectively 1:1.

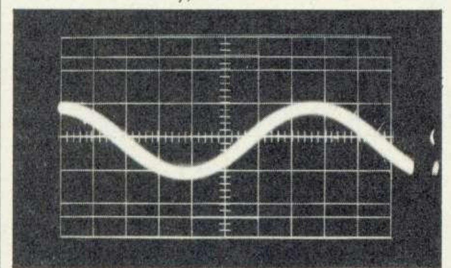

Figure 3. Output from an old music recorder

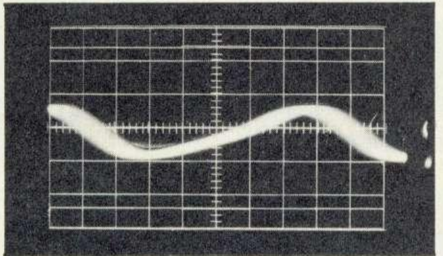
Figure 3 shows the same tape played back on a rather old but well-maintained portable music recorder. The signal swing is smaller, indicating reduced output, and the trace is thicker as there is substantially more jitter. There is also a small (relatively insignificant) phase shift on the rising wave, ie, the mark/space ratio is not quite 1:1.

The trace in figure 4 is the output from the same recorder as in figure 2, of a copy tape made by direct recording onto another good machine of the tape used for figures 2 and 3. The signal is of relatively low amplitude, and there is considerable horizontal jitter, as the speed variations of both recorders are combined. The most significant thing about this trace, however, is the mark/space ratio of the signal, which is now in the region of 3:5.

Bearing in mind that the Atom generates the low tone by leaving out a cycle of the high tone (figure 5), which creates a transition mark/space ratio of 1:2 (marked A in figure 5), this tape is just within limits and the signal will still be recognised as high tone leader. In fact, all the above signals are perfectly adequate for reloading at 300 baud.

All ordinary cassette recorders now have automatic level control. This uses the incoming signal to charge a capacitor which controls the bias of a transistor (or IC equivalent) in the record preamplifier. The voltage on the capacitor, and therefore the level of gain control, depends on both the amplitude and the frequency of the incoming signal. There is also a leakage path to discharge the capacitor again so that the level control can reset itself. The discharge time is, of course, always longer than the change time, so that the control will have a rapid response when a large signal arrives, and will then be released slowly to avoid unpleasant surges in volume. Here, however, is a snag for the computer person using an ordinary cassette machine for data recording. The initial response of the level control to the incoming signal is not instantaneous, so a cycle or two of tone may get onto the tape at a much higher recording level than the remainder which gets clamped.

There is a possibility, if the release time of the level control approximates to the high tone leader frequency, that the high tone leader will be permanently clamped to the minimum recording level as soon as the level control has responded. This alone would only necessitate turning up the volume of


Figure 4. Trace produced using a copy tape

the cassette machine on playback, but here lies the snag. The high tone leader is permanently clamped, because the level control is only just about to reset when another cycle of the tone arrives, but what happens when the Atom starts putting out data? The tone starts switching between high and low frequency, and every time the low fre-

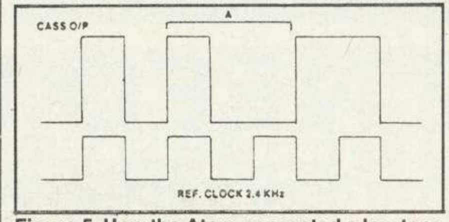
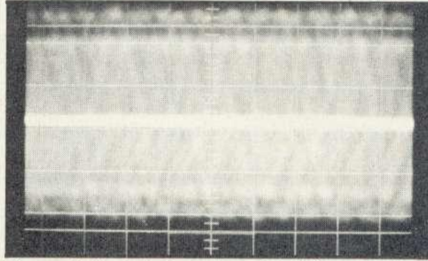


Figure 5. How the Atom generated a low tone

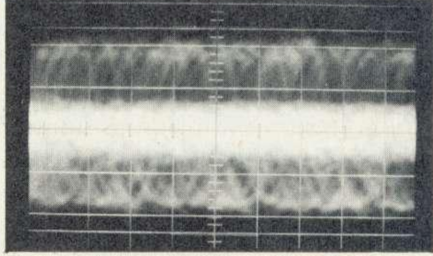
quency tone is sent, the cassette machine level control has time to reset itself during the double width pulse of the low tone. As soon as the next cycle of tone arrives, it is recorded at full amplitude while the level control is getting ready to respond again. The result will be a spike of very high level at the start of every low frequency cycle, ie, a grossly distorted low frequency waveform, which the computer may not be able to interpret. As each byte of serial data is preceeded by a logical Zero start bit at 1.2KHz (a low frequency tone) there is a risk that every byte will be corrupted.

Figures 6 and 7 are amplitude band traces of the output from two tapes. The relative width of the bands is proportional to the signal amplitudes. The two figures are not to the same vertical


Figure 6. Level clamping of a data recorder

scale. Figure 6 illustrates the level clamping of a good data recorder. The broad central grey band shows the amplitude of the high frequency tone, and the wider faint grey band shows the amplitude of the low frequency tone. The low frequency tone is only about 20 per cent louder (for want of a better word) than the high frequency tone, which is well within safe limits. The bright line through the centre of the trace is due to an idling 'scope spot and should be ignored.

Figure 7 shows the result of incorrect clamping as discussed above. Here the inner band indicating the high tone is only about a quarter of the width of the


Figure 7. Trace of incorrect clamping

outer (low tone) band. This is quite hopeless, as only one of the two tones can be sent back to the Atom at the correct level, whatever you do with the volume control. The cassette recorder that produced this tape is a write-off as far as data recording goes.

The ideal answer is to get a recorder which has a manual volume control. This unfortunately either means using reel-to-reel tape (as I myself did for some time) or spending almost as much as a disc system costs these days. The alternative is get your cassette machine from a reputable source with an explicit undertaking that it will do the job of Atom data storage or you can take it back. Needless to say, if you have a friend with a 'scope, or get into contact with an Atom supplier, you can check your existing equipment, but as most of the recorders today use a single chip to handle all internal functions, you can't get in to do much about the fault if you find it.

BUSICHART TOP TEN

Position	Package	Publisher	Price
1	Mini Office	Database	£5.95
2	View	Acornsoft	£59.80
3	Database	Acornsoft	£11.90
4	Wordwise Plus	Computer Concepts	£56.35
5	Accounts (series)	Gemini	£99.95
6	ViewSheet	Acornsoft	£59.50
7	Betabase	Clares	£25
8	Masterfile	Beebug	£19
9	Ultracalc	BBC Publications	£79.50
10	Discmaster	Beebug	£19

Best-sellers in the business

THIS is the first in a series of specialist charts prepared for *Acorn User* of the best-selling business software.

As well as the games table, which has been running for 18 months, there will be education and business versions (see page 155).

The charts will give new users a guide to the most popular software worth checking out. But before buying, make sure the product meets your needs. Remember that reviews can be valuable in this area, if you've got some idea of the preferences of the writer.

Figures are based on a panel of dealers and retail outlets for a period of four weeks up to, in this case, the beginning of May.

Beta ledgers launches series

CLARES has released *Beta Accounts*, the first in a series of software that will be integrated so that data from one package can be used in another.

The program is disc-based and costs £25. It can generate delivery notes, sales ledgers, VAT details and transaction files. Clares says it is compatible with the company's *Betabase*, which 'will soon be compatible with *Ultracalc* from the BBC'. *Beta Accounts* is available only on disc, and needs at least a double-sided drive to run on.

Details from Clares Micro Supplies, 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DA.

Acorn Users boost CP/M club

ACORN USER readers have inundated the CP/M User Group since the start of Edward Brown's series on using this operating system on the BBC's Z80 second processor.

Almost 200 people wrote in for membership after the first article, making BBC owners one of the biggest groups in the 2500-strong society.

Contact CP/MUG at 72 Mill Road, Dartford, Kent DA2 7RZ.

Micro owners' reference guide

TRAINING and communications are two of the topics covered in the 1985 edition of *The Microcomputer Users' Year Book*.

The book costs £35 (UK postage £2.20 extra) from Sian Rich, Database Directories Circulation, VNU, 53-55 Frith Street, London W1A 2HG (01-439 4242).

Acorn tops small business league

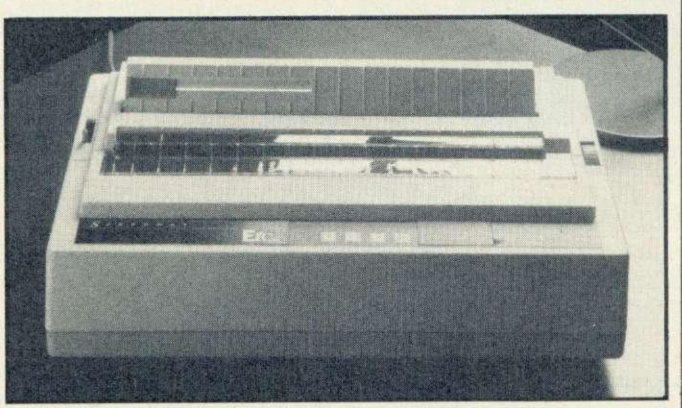
ACORN has a higher market share among small business users than any other micro manufacturer. This was one of the conclusions of a nationwide survey carried out in January among 2000 small businesses representing all types of industry.

The survey found that of an estimated 347,000 machines being used by small businesses, 16 per cent of them (or 56,000 machines) were Acorn micros – the survey does not distinguish between a manufacturer's different models.

This figure puts Acorn clearly in the lead in this market sector – ahead of Apple with 14 per cent and Commodore with 13 per cent, and leaving ACT (7 per cent), IBM (6), Sinclair (6) and its parent Olivetti (4) well behind.

Breakdown of Acorn's market share by special criteria reveals that the BBC micro is a firm leader in the southern half of the country, that its share is higher in regional areas rather than in major cities, where ACT edges ahead, and that its stronghold is branch offices, depots and domestic business enterprises. It is the most likely machine in businesses employing between 10 and 24 people (cut-off point for the survey is companies employing 50-plus).

The survey, called *The UK Small Business Microcomputer Market 1985*, was prepared by Gowling Marketing Services of Liverpool (051-236 6036), and costs £90.



THIS office daisywheel printer won't drown your phone conversations, according to its supplier, Enterprise Technology Computing. Called Speedway, it costs £1395 plus VAT and incorporates a 16k buffer, allowing storage of up to ten pages of text. RS232 and Centronics parallel interfaces make it suitable for use with most wordprocessing and graphics software, it prints at a claimed 45cps and offers 30 wordprocessing and 26 dataprocessing typestyles. Paper widths of up to 16.7in are accepted and a variety of paper handling options are available. Contact ETC on (0925) 824645.

A program you can bank on

KEEPING out of the red is the aim of *Bank*, a program from Diamant Software.

It gives an accurate statement of an account, and can cope with up to 50 standing orders which are automatically triggered each month. All this depends on your keeping it up to date, of course, and the program will give seven days' warning of payments due.

Bank comes on tape or disc (in 40 and 80-track versions) for £12.50.

Diamant Software is at 7 Goodwood Avenue, Manchester M23 9JQ.

Payroll upgrade from Micro-Aid

AN extended version of Micro-Aid's popular *Payroll* package is now available at £49.95 plus VAT.

It includes random access data files operating on two discs using one or more drives, allowing for 125 employees on 40-track, 250 on 80-track single density and 200 and 400 on double density. *Payroll* supports all NI and tax codes, three variable overtime rates, seven methods of payment and two different styles of payslip with preprinted twin NCR or plain paper.

Further information from Colin Chatfield of Micro-Aid on (0209) 831274.

Action stations

STATIONERY, discs and printer supplies are available day and night from Action Computer Supplies. Orders received by 5pm should be despatched by 6pm.

Contact Action at 6 Abercorn Trading Estate, Manor Farm Road, Wembley HA10 1WL. Tel: 01-903 3921.

FOR PUBLIC CONSUMPTION

Edward Brown reveals the sources of free business software for CP/M users

OVER THE past few months, in the CP/M corner section, I have referred to software that is available in the public domain and which can be obtained by CP/M Users' Group (UK) members for a nominal copying fee. The purpose of this article is to introduce you to the CP/M Users' Group (UK) and the library of public domain software that it keeps. Later in the article I will be describing some of the programs in the library and in future articles I will be showing how to implement some of these on the Z80 second processor. In addition, I shall be taking a brief look at the recently published first edition of *The Free Software Handbook 1984-1985 CP/M Edition*.

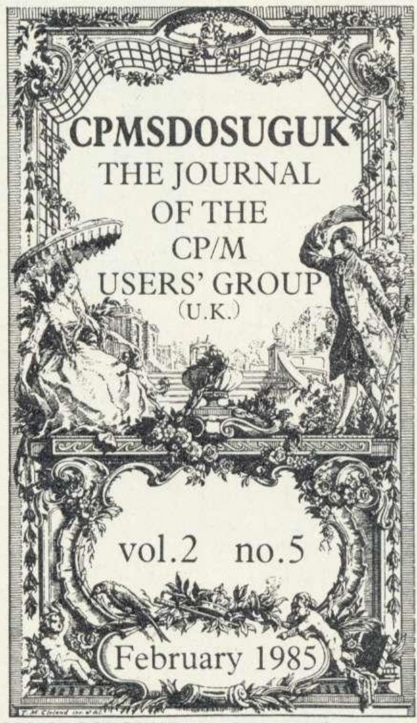
CP/M Users' Group (UK)

The CP/M User's Group (UK) was formed five years ago by a handful of people with an interest in CP/M and its associated software. Today the group boasts a daily-increasing membership of over 1500. As well as covering CP/M the group has widened its sphere of interest to include other Digital Research products, eg, MSDOS and PCDOS. From the very beginning it has relied on members' contributions for its finances and publications. The current cost of individual membership is £7.50 a year and for this the group provides:

- Publications to keep its members informed and entertained.
- Access to a library of catalogued public domain software.
- Seminars on topics of interest.
- Local branches for 'grass roots' support.
- Discounts for group members.

Publications

The first journal, published in November 1980, consisted of 30 typewritten pages. Since then it has gone from strength to strength and February's issue had over 120 pages. This increase in size is reflected in the content which is of use to one and all. The journal still retains a character of its own with such old favourites as Uncle David and Debugger but has added newer items – reviews, letters and local group news. The journal is published four times a year as and when there are enough articles submitted by members.



CPMSDOSUGUK journal: quarterly

A newsletter is published between journals and its main purpose is to keep members up to date with the library. It includes the latest additions to the library as well as short reviews, articles and members' letters.

Seminars

The group aims to hold seminars once a year on topics of interest to members. The last seminar was on operating systems and the main speaker was Gary Kildall of Digital Research who originally wrote CP/M. The committee is currently arranging the autumn 1985 seminar which will be on computer languages. It is hoped that someone from Locomotive Software will be speaking on Mallard Basic, which will be of particular interest to people who own the Z80 second processor.

Library

The group supports a large library of public domain software which is available for a nominal fee to members. The number of volumes in the library is constantly on the increase. The vast majority of the software is CP/M based although the group does also support a MSDOS and PCDOS library.

At the time of writing, the CP/M libraries held by the group contain over 300 discs of software. Most of this comes from the Sig/M group in America. However, the UK group library contains some 23 discs of useful software including assemblers, disassemblers, BBC Basic help files, small-C and various other useful utilities. The group produces a catalogue of the software with updates published in the journal and newsletter.

Local branches

Local branches meeting once or twice a month have been encouraged and more are in the planning stage. The Chiltern branch runs a computer bulletin board system (CBBS) which is currently available to all members of the group and it is hoped that the concept will spread to other branches. The CP/M Users' Group (UK) can supply a list of all the local branches on request – their address is on page 127.

What is public domain software?

Public domain software is a body of programs that have been made available for free copying and use. The software easily rivals commercially available software on a cost versus performance basis. With over 300 discs available in the library of the CP/M Users' Group (UK) it is difficult to say which are the best and worst of programs. A great variety of programs, from games through applications to languages and communications have been donated by their authors. When a program comes into the public domain it is often adapted and updated. In most cases this improves the original program but can lead to confusion, with several versions of the same software floating around. Not all public domain software is held and I will only be dealing with software currently to be found in the CP/M Users' Group (UK) library. Since the idea of public domain software is that it should be freely available to anyone who wants to use it, the CP/M Users' Group (UK) only charges for copying, media, post and packaging.

page 125 ▶

GLENTOP PUBLISHERS

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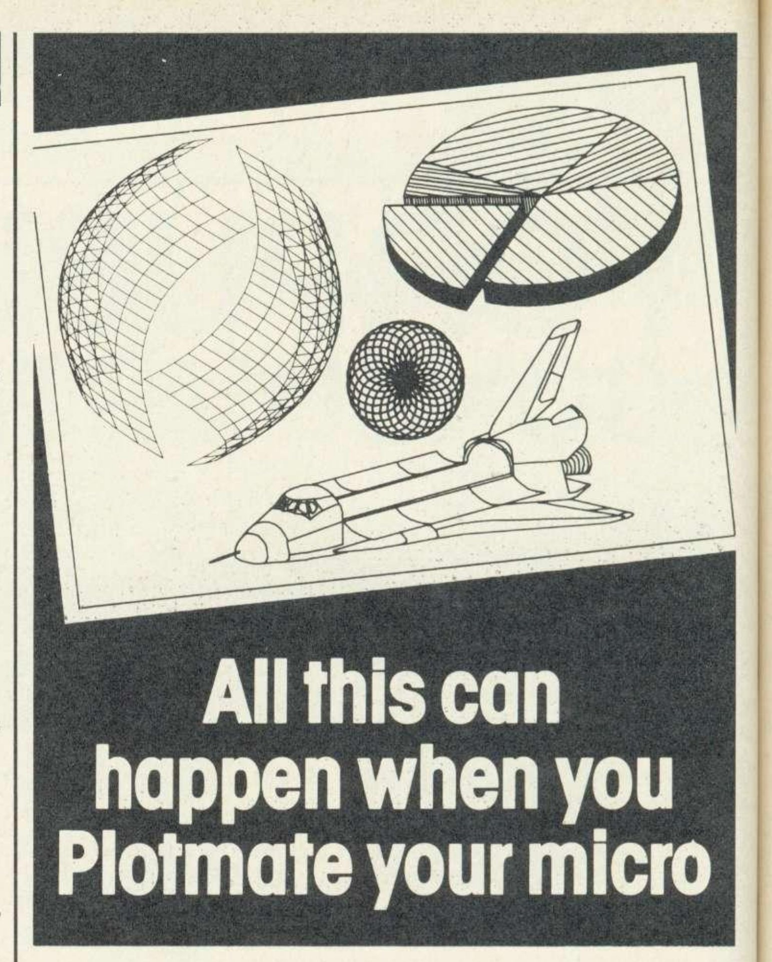
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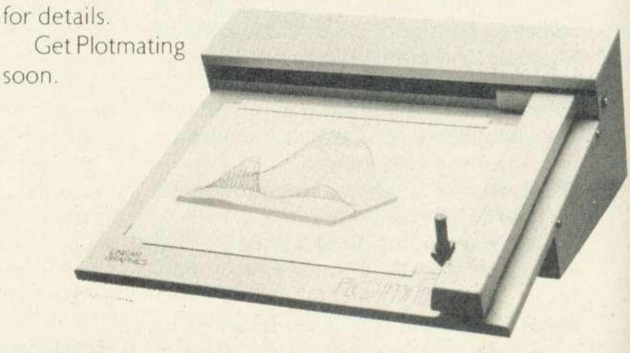
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The Free Software Handbook

This book answers all the questions about public domain software and its authors. It includes some 70 programs with a selection of games, utilities, communications and applications programs. The book was written in the USA and doesn't cover the UK library, although many of these programs are versions adapted for UK use from those available in the US. All the programs are available from the UK distributor for a nomimal copying fee. They are well worth the money and provide a starting point for collecting public domain software.

The majority of programs supplied are in a ready to run (COM file) form and all seem to work on the Z80 second processor (they have not been tried on a Torch). Unfortunately, there is no indication where the source can be found if you want to customise a version for your own machine.

Although expensive by comparison with other home computer books, the combination of book and software at £27.95 represents excellent value for money. This is one book I will be keeping close at hand for ready reference in future.

The programs

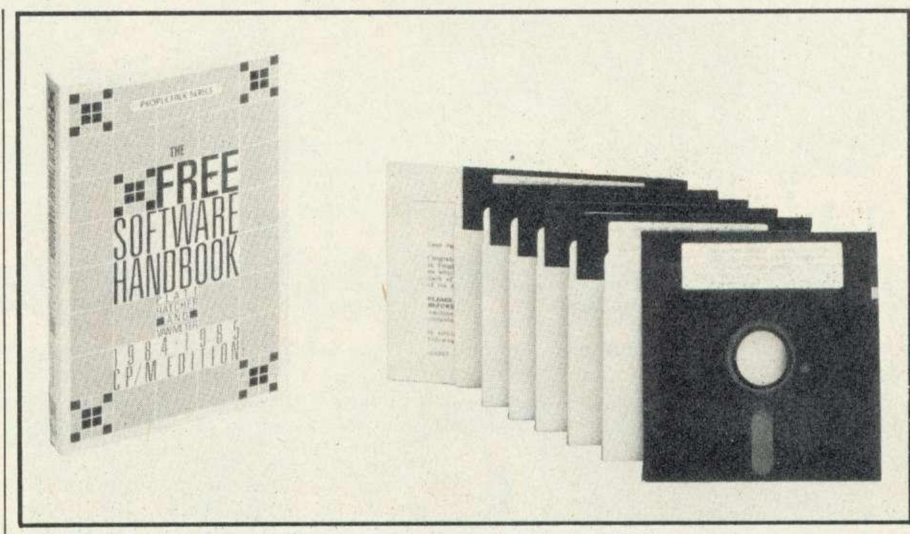
It is always difficult to know where to start when selecting a few programs from such a large library. Because of this I will only describe public domain programs I know and use. These are not necessarily the best programs or the most popular. The journal and newsletter of the CP/M Users' Group (UK) gives a 'top ten' of volumes copied.

ADV

This is the classic game of adventure implemented under CP/M. As with all adventures you search for treasure – hidden in caves – and face various perils. Everything you come across has some use and if you can't find it you haven't tracked down the problem it was designed to solve. I still find this adventure one of the most subtle and interesting I have played. One tip for those of you about to play: read and understand all the messages. This program is on Sig/M volume 3 and is one of those supplied with the *Free Software Handbook*. The program is 36k and the data 155k.

UKM7

This communications program has been adopted by the CP/M UG (UK) as its standard for data transfer. It provides much the same facilities as BSTAM in that it allows you to transfer ASCII and binary files between machines and to use your machine as a remote terminal. Next month I will be dealing with communications and showing you how to configure this program for the Z80 second processor, to enable you to transfer programs and access bulletin boards.



Free Software Handbook and software: includes a selection of 70 programs

Useful addresses

Membership Secretary,
CP/M Users Group (UK),
72 Mill Road,
Hawley,
Dartford,
Kent DA2 7RZ.
Tel: (0322) 22669

Sidelight (Torch User Group),
69 The Avenue,
Wembley,
Middlesex HA9 9PH.
Tel: 01-904 9323

Davis Rubin Associates,
1 Canonbourne,
Weston sub Edge,
Chipping Campden,
Gloucestershire GL55 6QH.
Tel: (0386) 841181

Title	No of discs	Country
Sig/M	223	America
CP/M UG (US)	57	America
CP/M UG (UK)	23	UK
CP/M gg	7	Netherlands

CP/M Users' Group (UK) library

ERQ

How many times have you typed something like ERA *.COM only to find that you have lost all your utilities as well as the programs you intended to delete? Well, this program is for you – it doesn't guarantee to stop you deleting files you want, but it does ask you to confirm each file before deleting it. Combine this with the patches shown last month and you have a safer system. This program comes from CP/M UG (UK) volume 9.

NWSWEEP

Copying, printing, viewing, erasing, renaming and squeezing of individual files or groups of files are all part of this program – it is possible to move up and down a directory and alter files. If you forget the commands just type a question mark and it will remind you. This program is available in many versions but the latest will always be available from the CP/M UG (UK) library. It's also in the *Free Software Handbook*.

VFILE

If, like me, you can never manage to get to the CTRL S in time when you are typing files then this program is a boon. It allows you to go up, down, left or right in a file, viewing it as ASCII or hex data. This program is available on CP/M UG (UK) volume 10.

FIND

This is a straightforward program to find a string in a file or group of files. It is supplied on volume 0 of the CP/M UG (UK) library, which is the complete catalogue of available discs and is used to find which contain programs you are interested in.

There are later versions that allow you to find items in squeezed files without unsqueezing them.

REZ80, DISZ80

These are disassemblers which take a file with a COM extension and change them into Z80 mnemonics. They produce output that is suitable for ZSM

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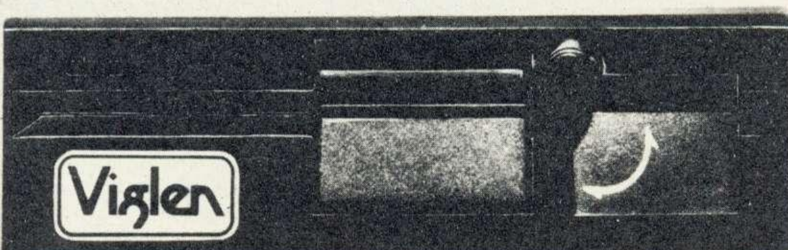
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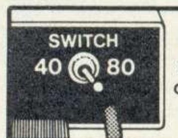
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AU 7/2

(see below) or M80. Both work efficiently and can provide hours of fun as well as an insight into the way programs are written.

If you like a challenge, try to disassemble the program DIAG in the public domain. The source is provided on the same disc so you can compare your result with the original.

REZ80 is on CP/M UG (UK) library volume 9 and two versions of DISZ80 can be found on CP/M UG (UK) library volumes 21 and 22.

ZSM

This seems to be the only Z80 assembler in the public domain at present. It will assemble legal Z80 instructions but does not pick up all illegal instructions and is not good for the inexperienced programmer. The assembler is currently being updated to get rid of some of the worst errors.

MPRINT, PINIT

These two programs are from the CP/M UG (UK) library volume 9. They allow you to print multiple files and to initialise your printer to a specific setting such as bold characters.

Other programs

I have presented just a small selection of programs which can at best scrape the surface of what is available. Other programs are equally as useful or interesting as those I have covered. I think the range of programs covered by the libraries is comprehensive and you should be able to find one for your needs.

Title: The Free Software Handbook
Authors: Platt, Hatcher and Van Meter
Publisher: Peopletalk Associates Inc.
UK Distributor: Davis Rubin Associates
Cost: Book only £17.95 (plus £1 p&p)
*Book and disc £27.95 (incl. p&p and VAT)
* Software £10 (plus £1.50 for p&p and VAT)
*The buyer supplies discs pre-formatted for the software to be copied on to and is only charged for the copying of the software. There is 1.2M of programs so you will need to supply four discs.

NOTE: Edition one of the book was used for this article but edition two will be supplied to buyers. This gives details of more recent versions of the programs and removes some of the mistakes in the original text.

CP/M CORNER

More CP/M advice from Edward Brown and Richard Clement

Dialects of Basic

OVER THE past few weeks I have had several letters about problems using the OSBYTE and OSWORD calls from BBC Basic on the Z80 second processor. In most instances the person writing had assumed it was some additional hardware causing the difficulty. I checked all the examples given and came up against the same problems in my own machine which has no additional hardware.

In fact they were all caused by a defect in the Basic programs. All the programs had used H% and L% as the variables for making OS calls. This is incorrect: X% and Y% should be used, exactly as they are on the BBC micro by itself. BBC Basic on the Z80 second processor has been designed to be compatible with the standard BBC Basic to make programs transportable between the two systems. BBC Basic takes care of mapping the variables X% and Y% on to the Z80 registers.

In the majority of cases programs can be taken from the BBC and run on the Z80 without alteration and there should be no need to refer to anything except the *BBC Micro User Guide* for writing programs. The *Z80 BBC Basic User Guide* provides a list of the differences between the two versions of the language. It is best to read this booklet several times as the neccessary information is not always where you would expect it. For example, the information about HIMEM is in the section on program flow control.

More fonts for MemoPlan

MOST MODERN dot matrix printers have the ability to produce different character sizes and qualities. Using CONFIG.COM it is possible to select different printer types but not how *MemoPlan* uses them. *MemoPlan* uses only one font which is set up when MEMOP comes to print a file.



MemoPlan has only one print font but it is possible to use other typefaces

If you want to use a different font for the whole of your document then initialise your printer using a program such as PINIT (from the CP/M UG UK library), take your printer off-line, run MEMOP, when it prompts 'Printing file. . . on device. . . . ' put the printer back on-line and answer Y. This will now print in the font that you set up.

Beyond this there is little that can be done without using a program such as *Fancy Fonts* or *Polyprint* until Acorn release their upgrade to *MemoPlan*, which should provide many of the features omitted from the original.

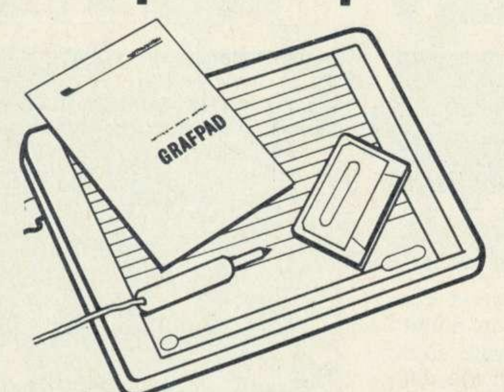
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If you're a CP/M user with problems, or have hints you'd like to pass on, then write to CP/M Corner, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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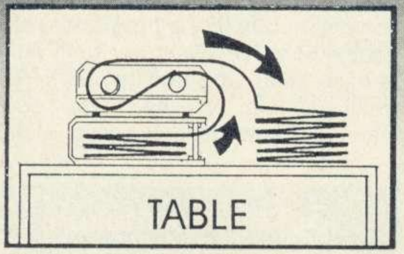
Computer aided design programme. Drawing programme etc.

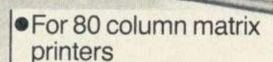
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AU 7/5

MEP software distribution initiative

RESOURCE is an initiative of the South Yorkshire and Humberside MEP to distribute teachers' software.

It was launched in March and is a co-operative, non-profit-making venture by the MEP region and its constituent LEAs – Barnsley, Doncaster, Humberside, Rotherham and Sheffield. It was set up to help teachers develop ideas, and provides an outlet for the resulting materials at a reasonable price.

Programs already established are *Birdwatch* and *Flowersearch* – databases for primary schools which permit graphing; *Control Basic* which adds useful control commands to Basic; *BITS* – a Logo type control program for younger children; *IT in the Secondary School* – an extensive pack of teaching materials and programs; a light detection kit which allows pupils to explore computer control and analogue systems and the *Castle* pack – a many-faceted pack of materials for 9 to 12-year-olds.

Recent programs for the primary age group are *Library* – a database for a small library simple enough for children to search; *Census* – a simple historical database for data from local villages; *Place Names* – to analyse and give information on place names which can be developed by pupils; *Weather* – a database and graph pack for recording meteorological information and *Which Flower* – for flower identification.

New for special education are *My Word* – a text construction program for those with visual or motor handicap; *CAGE* – a program which allows the teacher to design simple exercises, programs for concept keyboard and Walsall board; language programs for the deaf; and a powerful database.

This is a development to watch. What a pity there are not more initiatives producing this quality at reasonable prices. More information, prices, etc, can be obtained from RESOURCE, MEP Regional Centre, Exeter Road, off Coventry Grove, Doncaster, S Yorks. Tel: (0302) 63784/63800.

Publishers 'won't touch' school software

THE reluctance of commercial publishers to touch any software not immediately transferable to the home environment is worrying many readers.

John Willets writes: 'I devise CALL (Computer Assisted Language Learning) software, it's quite successful, it's even been demonstrated on Swedish TV – British teachers want to use it and they want French and German versions. But Acorn, the MEP and the British Council can't even be bothered to look at it.'

Teacher-created software is often designed for a particular purpose in the classroom – to demonstrate a principle, highlight a problem or just to display information more effectively than with blackboard and chalk. Of course, the teacher tends to integrate his or her own style of teaching into the design and so a very personalised sort of software is created – one that publishers are often unwilling to touch. But why? If it works well for one teacher, why not for another?

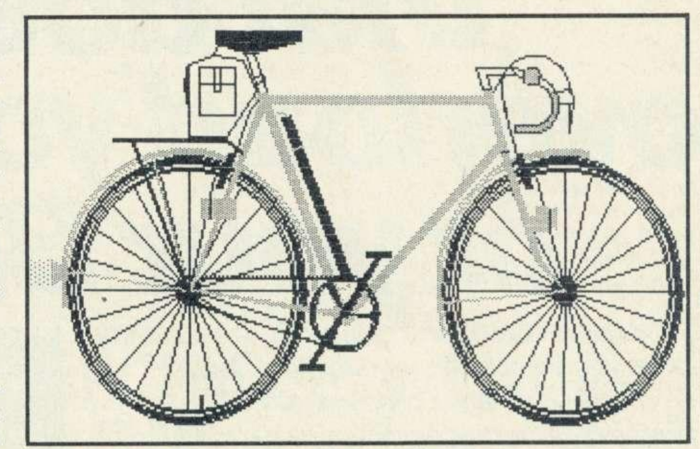
There are many reasons. The programming itself may not be of a high standard, the program may be difficult to drive and its idiosyncracies known only to its creator! There is often no documentation since the writer usually knows what he or she intended and therefore has had no need to commit it to paper, although this is not the case with my correspondents.

So if others are going to use the program it should have a clearly defined path of development – a flowchart perhaps – and also have documentation containing all the necessary information to implement the materials in a teaching situation. However, there are some readers who will say 'But I did all that and publishers still won't touch it!'

The problem in this instance is market forces. Commercial publication of a program as an individual item is a tricky and expensive business. Packaging, advertising and production run into thousands of pounds for serious promotion and so a publisher has to be fairly certain of receiving a return on his investment. Nobody seems to be willing to market amateur programs for classrooms apart from a few local authorities and some MEP regional organisations.

An example of software which has been taken up by an imaginative distributor is David Seume's on Road Safety and the care and construction of bicycles – published through Surrey County Council Road Safety Section. There are programs, all of them Electronic Blackboard, which build a bike piece by piece (both standard and BMX); traffic lights, with manual control and text overlay; pelican crossing from the driver's and the pedestrian's points of view; and a suite of road signs.

All these items are immaculately produced with large scale graphics for clear visual presentation in the classroom. They don't do anything except draw pretty pictures on the screen with a small amount of text, and yet it is the most striking software for schools I've seen for a long while. It is vivid, bright, and costs £14.95.



Striking: David Seume's Road Safety software

So if you're about to embark on a program to save the educational world, first consider whether the people who it's aimed at will be able to use it easily, and whether a publisher will find a ready market for it. If not, then some other agency should be contacted; your local MEP regional centre or even your local authority's microelectronics adviser.

David Seume may be contacted c/o Surrey County Council Road Safety Section, Highway House, 21 Chessington Road, West Ewell, Epsom, Surrey KT17 1TT. Tel: (0483) 571417, and John Willets at The Barn, Spring Lane, Romsley, West Midlands B62 0NA. Tel: (0562) 710428.

MEP fund OU micro training packs



Open Logo: a pack option

A SERIES of self-teach training packs have been developed with funding from MEP by the Open University's Micros in Schools Project. It is designed to increase basic awareness from software design to the understanding of microelectronics.

It includes their *Desmond* microelectronics tutor, which is a marvellous guide, even for the uninitiated, and two of the packs include BBC Publications' Open Logo as an option.

Details from Micros in Schools Project, Open University, Milton Keynes MK7 6AA. Tel: (0908) 367264.

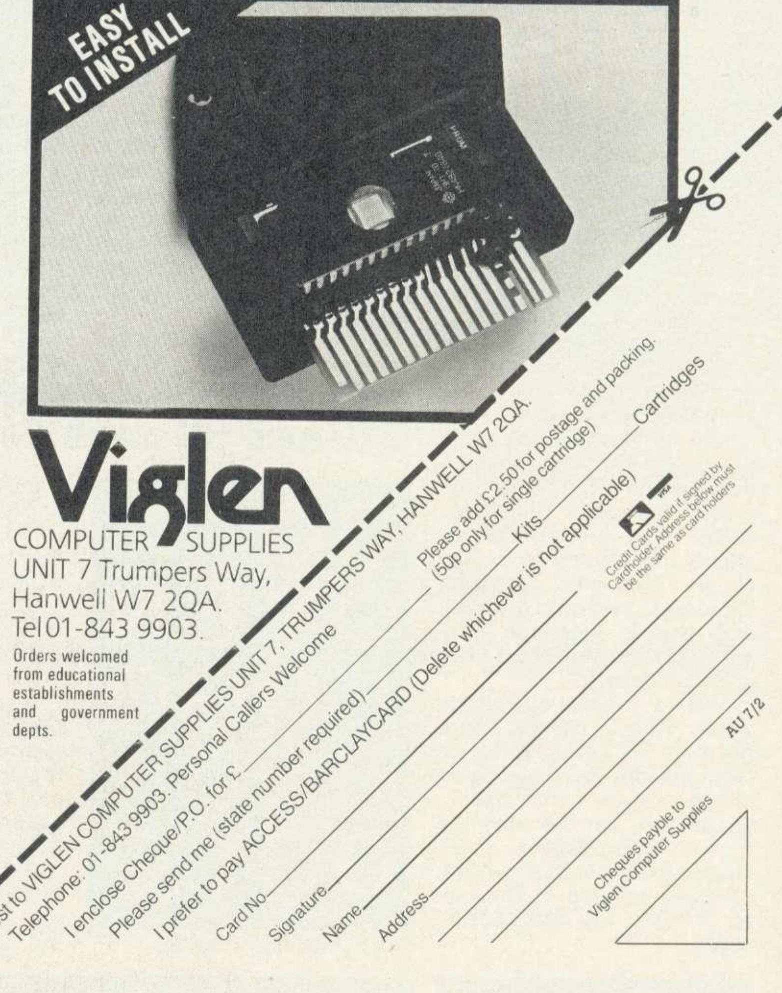
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The growing list of educational software for the Electron

A LARGE response was generated by my request for details of software for the Electron that was suitable for school use.

The most comprehensive response came, not surprisingly, from a dealer, AVP Computing, Hocker Hill House, Chepstow, Gwent. Tel: (02912) 5439. Some teachers will already know this company from their overhead projector and slide materials. They produce a 48-page catalogue of educational software containing a vast number of programs, many unique to themselves. It's certainly worth a read since, like the Acorn International catalogue, it contains descriptions of what the programs are about and what they do, but not all are for the Beeb or the Electron.

Mirrorsoft joined the rush to point out that the following titles run on the Electron: *First Steps with the Mr. Men, Here and There, Count with Oliver, Look Sharp, Quick Thinking, Quick Thinking Plus, Mastermind, Mastermind Quizmaster* and *Star Seeker*.

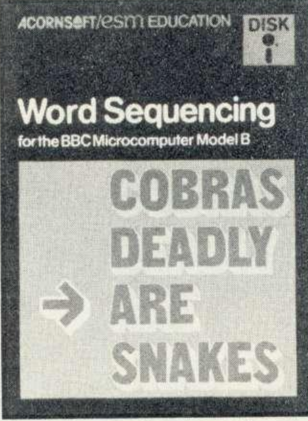
These titles are available from Acornsoft for the Electron: *Tree of Knowledge, Peeko-computer, Business Games, Workshop, Talkback, Sentence Sequencing, Word Hunt, Word Sequencing, Number Balance, Missing Signs, Maths 1, Maths 2, Biology, English* and all ASK programs.

The Revise GCE/CSE series from Ivan Berg Software, 4 Daluce House, 4-8 Canfield Gardens, London NW6 3QT, tel: 01-328 3341, were omitted from the list. Titles of these revision courses are *Maths 1, Maths 2, English* and *Biology*. All run on the Electron.

HIMAP, 8 Wishart Road, London SE3 8PP, wrote to say that its programs, which run on Electron and Econet Level 1, include such titles as *Gridrefs, Europe* and *Glaciers* as well as *Sportsmaster* and *Markbook* (not Econet).

MRH Software of 20 Highfield Road, Kidderminster, Worcs, point out that their Reading and Language Development Series has been deliberately designed to run on the Electron as well as the BBC micro.

Finally, my thanks to those without a vested interest – Alan Webb from Bridgnorth, Salop, sent me a list including many of the MEP programs available, and to Jim Milton from Hereford and Worcester's Micros and Educational Technology Centre who has produced a list of everything he has come across. Unfortunately, we don't have room for it all, but here's Jim's list of publishers: Acornsoft, ASK, Beebug, Bel Tech, Bourne (BES), Chalksoft, Comsoft, Database, Dobsoft, Elm, ESM, Flite, Garland, Gem, Goldstar, Golem, Highlight, Hodder, Kosmos, LCL, Marmik, Micro Power, Mirrorsoft, Penguin, Salamander, Silversoft, Spinnaker, Synergy, Tiptree, Tom Shipman, Tutorial – all of whom produce Electron software. The addresses for most of these were in the May issue of *AU*. Failing that please contact this column – by letter *only*.



Word Sequencing: one of Acornsoft's Electron packages

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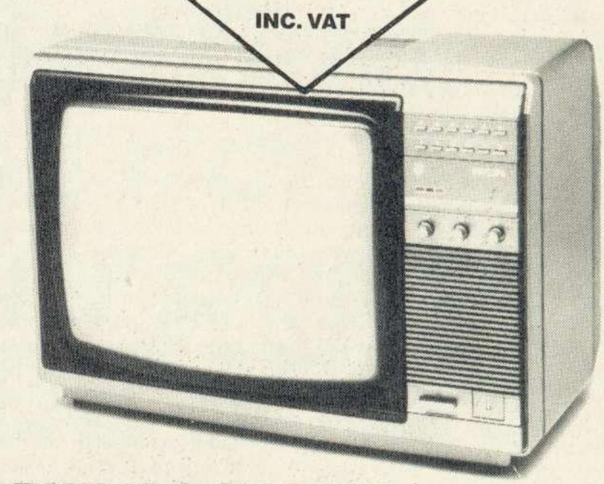
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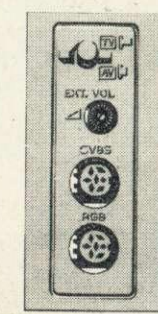
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ON THE DISC DRIVE TRACK

Bruce Smith guides you through their pleasures, pitfalls and prices

WHAT'S the question most frequently asked by people who've just bought a Beeb or Electron? 'What do I buy next, a printer or a disc drive?' My advice is invariably a disc drive, because unless you have a special need for a printer, discs are much more useful. Programs can be saved and loaded instantly, and the micro's random access filing capability can be exploited to the full, ie, using it with databases.

Disc drives are also considerably more reliable than tape – you can say goodbye to fiddling around with the cassette volume and tone controls in an effort to get the program to load! Loading a typical 32k program will take about two seconds from disc compared to up to 10 minutes on a cassette recorder.

What's needed?

In addition to the disc drive you'll need a disc interface upgrade. If you bought your Beeb with a DFS (Disc Filing System) fitted then you only need to attach a suitable disc drive and away you go. If not, you'll need to have the disc interface fitted.

Electron owners have three options: Acorn's Plus 3 which comes complete with DFS and 3.5in drive or a Cumana or Solidisk interface which require you to choose a drive, so read on to find out about the options.

The Beeb upgrade can be done either through your local dealer or by yourself. Both options have their pros and cons.

The dealer will charge you and might also insist you purchase a particular DFS interface – okay if you don't mind the type of upgrade fitted.

Fitting the interface yourself is no problem if you have the ability. Obviously, you can choose which disc interface you want and there are no hidden charges. The disadvantage is that you will invalidate any guarantee rights you might have – this wouldn't be the case if an approved Acorn dealer undertakes the job.

The purpose of the disc interface is described by Vincent Fojut on page 175, and his review will be updated in a future issue.

PHOTOGRAPHS BY CHRIS BELL

The drive

The disc drive itself consists of a motor which spins the disc, plus a mechanism to move a reading and writing head accurately across the surface of the disc. There's also a printed circuit board containing the electronics that transform and transfer the data between micro and disc surface. Some disc drives also contain their own power supply units (PSUs).

The disc itself may be single-sided, in which case data (programs, text files or just anything you want to save) are stored only on the top surface of the disc. With a double-sided disc data can be saved on both sides – providing you have a double-sided drive (two 'heads', one top and bottom for each disc surface).

The amount of information that can be stored will depend on how many tracks the disc has. They normally have 40 or 80 tracks – a track is a concentric ring on the disc surface. An 80-track disc can hold twice as much data as a 40-track. As a rule of thumb, 40 tracks = 100k storage capacity.

Before a disc can be used it must undergo a process known as formatting. This is normally performed by the DFS or a utilities disc. Formatting electronically marks out the disc surface into tracks and also divides the disc into 10 equal-sized segments into which data fits.

It's not generally possible to use a 40-track disc drive to read a disc that has its data stored on 80-tracks because its mechanics are not fine enough to cope. However, you can use an 80-track drive to read information off a 40-track disc, in one of two ways. The most common method is to use a switch on the drive to make the drive head mechanically step two tracks at a time, reading every alternate track. This type of disc drive is known as a 40/80 switchable drive. The second method is to control the hardware directly with specially-written software. This will issue an extra track step command each time it wants to read the next track from the disc surface.

What size drive?

At present you can buy three different sized disc drives for the Beeb. The size refers to the dimensions of the disc itself. The three disc sizes are 3in, 3.5in and 5.25in. Of these the 5.25in drive must be considered as the standard – all software for the BBC micro is produced using this size.

The 3in system is a personal favourite of mine. It's small and very robust. Unlike the 5.25in disc, the 3in disc comes in a hard plastic case which protects the disc surface. Unfortunately, the 3in system does not seem to have caught the imagination of the software houses, and so there is only a minimal amount of software currently available in this format.

If you're looking to buy a good deal of commerical software you should really steer clear of the 3in drive, but if you're only interested in using it for a personal database, say, then it is an excellent medium and worth considering.

The 3.5in drive is really a business standard. The drawbacks are the same as the 3in system but there's even less software available for it.

In summary then, to be certain you can obtain all future software on disc, go for a 5.25in system. If this doesn't interest you then it might be worth looking at a 3in.

Getting on the right track

Having chosen the size drive you want, the next step is to decide whether you want 40, 80 or 40/80 switchable drives. In order of preference I would rate these in the order: 40/80, 40 and 80.

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with 200k of storage per disc side. The 40-track option can then be called into operation when required.

You might be surprised that I rate the 40-track drive above an 80-track drive, which has twice the storage. There are two reasons. First, the huge variety of 40-track drives available makes prices very competitive. Second, manufacturers seem to be phasing out production of stand-alone 80-track drives (see the tables), and are opting for a small switch circuit to convert the drive into a switchable one.

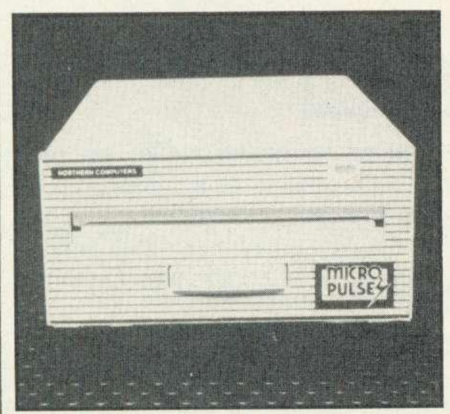
One point I should make here is that if you go for a 40-track drive, ensure it's of the 'small' head variety, not of the older, wide-headed type (most new drives will use a small head). This will ensure that your 40-track drive is capable of reading a dual format 40/80 disc. Wide-head drives tend to have problems as the head sits across two tracks (its own 40-track plus the intermediate 80-track) and therefore picks up garbled data.

Single, double or twin?

Your choice of drive will depend on your financial resources, but assuming that money is no object what configuration should you go for? My own order of preference is: twin double-sided, twin single-sided, single double-sided and single single-sided.

The point is that I would much rather own a twin single-sided drive rather than a single double-sided drive. Both offer either 200k (40-track) or 400k (80-track) storage capacity but the former offers it across two discs as opposed to both sides of a single disc. It also allows you to transfer files from one disc to another with the minimum of fuss, whereas a single double-sided drive will allow you to copy to the other side of your disc, but would involve a lot of disc swapping and changing. A single-sided 40-track drive should not be sneered at if money is tight.

If you decide to buy a single drive, ask yourself if you are likely to want to add a second drive at a later stage.



Micro Pulse: well priced 3in drive

Most single drives can have a second drive added to them reasonably simply. However, several suppliers now offer the entire twin case with only a single drive – to add a second drive you just remove the blanking plate and slip it in.

Power supplies

The power source for disc drives can either be contained within the drive (this is referred to as its PSU), or it can be tapped from the auxiliary power outlet on the underside of the BBC micro. Electron owners don't have this option, and so must invest in a drive with an integral PSU.

For Beeb users, the choice is up to you and will have to be made when you are considering which drive to buy. What are the pros and cons? The immediate plus is that a PSU makes it a completely self-contained and portable unit, requiring no assistance from your Beeb. This could be an important consideration if you wish to use the drive on another micro. If your Beeb contains an internal web of ROM and RAM boards, you're probably not going to have enough power to supply everything using the power outlet.

On the other hand, the PSU costs money – anywhere between £20 and £50 above the price of a comparable disc drive without one. The money saved could be the difference between having single or twin drives.

What's about?

Flicking through the pages of *Acorn User* will reveal a vast array of drives up for grabs, so let's examine what each of the major suppliers have to offer.

Akhter: No review models were available, but they seem to have a good range at competitive prices. Those at the top of the range come enclosed in a monitor stand.

AMS: Supply 3in Hitachi drives only. Excellent, but bear in mind the comments above.

Chase Data: No review models were seen, but again a good, very competitively-priced range. The 221A 40/80 double-sided drive looks excellent value for money.

C Tech: Only two drives are offered but the single-sided 40-track drive was only bettered in price (including postage and packing) by its Midwich counterpart (see below).

Cumana: Probably the biggest supplier of drives in the country, but you'll find it cheaper to buy one from a dealer than direct from them. Cumana has an excellent reputation for user support. In fact, it is the only supplier to specify that its independently-powered drives conform to BS415. All the current 80-track drives are switchable to 40-track (if you buy from a dealer check that you're not being sold old 80-track-only stock!), though my main criticism is that the switch is at the rear of the drive and not always easy to get at. The drives are also clearly numbered, and automatically eject the disc when the front flap is pressed. Nice drives – shame about the price!



Viglen: quiet operator

Data Track Technology: A British drive that's very impressive in operation and also cost effective at £181.70 inclusive. It's quiet in use, has copious amounts of cable to let you place it either side of your micro, it's very light and has an auto-eject disc feature. Once again, the 40/80 switch is hidden at the back of the drive, and the cable termination on the Beeb end of the ribbon cable leaves something to be desired. A good buy.

Electronequip: A good source for a cheap 3in drive.

GCC: The twin 40/80 is one of my favourite drives. It's quiet in use, and you can select 40 or 80-track mode at the push of a button. This is on the front of the drive, illuminates for 40-track operation and is extinguished in 80-track. With a built-in power supply it fits neatly on a shelf above the micro with the monitor sitting on top of it. The only bad point is it's price!

Keyaki: Well-priced drives. If you buy the first drive it's a simple matter to upgrade, and Keyaki supply the second drive £23 cheaper.

Microdis: Handle Cumana-distributed drives, at a lower price (see comments earlier).

Microman: Handle Cumana, Pace and Opus drives.

Microfast: Handle Opus drives (see below).

Microworld: A good source of the Cumana range of drives at reasonable prices.

Midwich: No review drives were available – prices are mid-range, and possibly offer best value for a 100k 40-track drive.

Northern Micros: Offer a well-priced 3in drive.

Opus: A wide range of reasonably-priced drives. Look for the special offers which include a cheap Opus DDFS. Slightly more noisy than other drives, and once again the 40/80

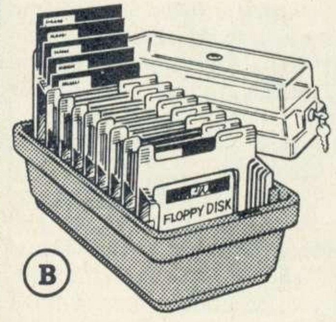
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(B)

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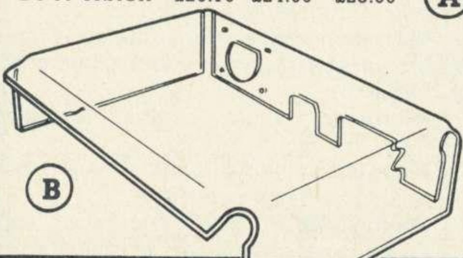
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(B)

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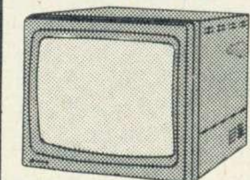
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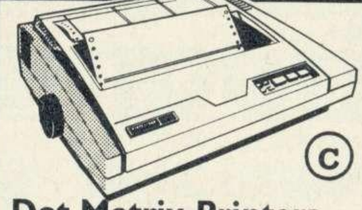
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models are switched awkwardly from the rear. Opus offer a 2-year guarantee which is worth considering.

Pace: Offer a useful well-priced range. Single to twin-drive upgrades are catered for by offering single drives in a twin case with the second drive position fitted with a blanking plate.

Solidisk: Drives are offered with a package deal of disc interface and software. The twin version forms part of a BBC motherboard and separate keyboard package. The drives are only 80-track but the Solidisk DFS will provide 40-track stepping. If you're looking for a complete package and the Solidisk DFS takes your fancy then it might be worth considering. Unfortunately, we didn't receive one in time to review for this issue, but we'll be doing so in a future disc update.

Technomatic: No review drives were available, but a wide range of well-priced drives are offered by this reputable company.

Twilstar: A good selection including a reasonably-priced Cumana range.

Viglen: One of my favourites among the review models – a quiet operator with auto-disc-eject. Again, the switchable models are controlled by an awful switch at the rear. At the time of writing, Viglen are offering a 40/80 double-sided drive plus Acorn DNFS upgrade (free of charge) and a comprehensive utilities disc for £229 inc VAT – not to be sniffed at. The drive on its own is good value at £129 inclusive of VAT!

Watford Electronics: A good range of very competitively-priced drives. The casing on the review model left something to be desired, however, as it's not 'square' fitting and has a good 5mm gap all the way round, leaving me asking how much dust would get in. Single to twin-drive upgrades are catered for by offering a single disc in a twin-drive pack. 40/80 drives are switched from the back, though the switches themselves are only bettered by the GCC drives.

Final choice

So what's best to get? The price of 40/80 drives seems to have dropped drastically, so if you can fork out the extra they're well worth it. The other drives will, I think, become obsolete in the next few years. The final choice must be yours, but broadly my recommendations would be as follows:

If you are buying a quantity of drives for an institutional establishment then I suggest you contact Cumana, or a Cumana dealer, to get details of discounts and the backup you'll want.

The Data Track Technology drive is delightful. Although single-sided, it is a twin switchable drive which is very cost effective. It is, though, a little noisy

Notes and key to tables

Each table is arranged in a similar fashion. The six columns provide the following information:

Supplier – Manufacturer or distributor of disc drive. Consult table for address and telephone number.

PSU – Yes, if drive is supplied with integral PSU unit. No, if power source is required from auxiliary power outlet socket. Electron users should look for a drive with a Yes in this column.

Price – The total cost, inclusive of VAT. See notes below.

P&P – Additional cost of postage and packing. Some manufacturers' prices will include this cost (inc) with others it will vary (extra).

Order No – This is the drive order number. Quote this, if it is given, when ordering a drive.

Notes – Details of offers or extras.

In some instances a distinction is made between belt-driven and direct-driven drives for similar models. In general, a direct-driven drive is preferable.

Retailers sometimes market distributors' drives and this is mentioned in the notes column, eg, 'Cumana' would be used to show that this is the same drive as the Cumana one described in the same table.

Most drives come complete with all leads, manual and utilities disc. If these are not supplied you'll see 'no extras' in the Notes column.

The information in this table was correct as we went to press, but always check with the supplier for up-to-the-minute price information before sending any money. As the table was being compiled Cumana cut its prices to those shown here. Other sources of Cumana-distributed drives are likely to do so in due course, so do check with them.

40-TRACK SINGLE-SIDED DRIVES – 100k

Supplier	PSU	Price	P&P	Order No	Notes
Akhter	No	£99	+£2.50	MD100	
Chase Data	No	£85	inc	110	
	Yes	£110	inc	110	
C Tech	No	£79.35	inc	40A	
Cumana	No	£99.95	extra	CSXL100	Belt drive
	No	£124.95	extra	CSX100	Direct drive
	Yes	£161.95	extra	CS100	
	Yes	£149.95	extra	CS100E	No 'extras'
Microdis	No	£113.85	inc	CSX100	Cumana
	Yes	£136.85	inc	CS100	Cumana
Microfast	No	£99	+£10	ALPS	
	No	£129	+£10		Opus
Microman	No	£119.95	inc	PSD1	Pace
	Yes	£159.95	inc	CS100	Cumana
	No	£169.95	inc	5401	Includes Opus DDFS
Microworld	No	£109.95	inc	CSX100	Cumana
	Yes	£149.95	inc	CS100	Cumana
Midwich	No	£80.44	inc	HC1 ALPS	
Opus	No	£119.95	inc	5400	Belt driven
	No	£149.95	inc	5401	Direct driven
Pace	No	£120.75		PSD1	
Technomatic	No	£97.75	+£8	TS100	
	Yes	£143.75	+£8	PS100	
Twilstar	No	£99	+£8		
Viglen	No	£119	+£12		
Watford	No	£102.35	+£7	CLS100	
	Yes	£136.85	+£7	CS100	

40-TRACK SINGLE DOUBLE-SIDED DRIVES – 200k

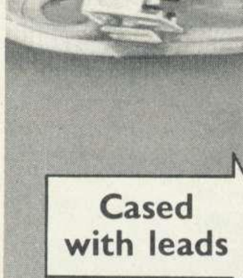
Akhter	No	£139	+£2.50	MD200	
Chase Data	No	£95	inc	210	
	Yes	£120	inc	210	
Cumana	Yes	£192.95	extra	CS200ED	
	Yes	£161.95	extra	CS200E	
Opus	No	£169.95	inc	5402	
Pace	No	£164.45	extra	PSD2	
Twilstar	No	£159	+£8		
	Yes	£179	+£8		
Watford	No	£113.85	+£7	CLS200	
	Yes	£159.85	+£7	CS200	

40-TRACK TWIN SINGLE-SIDED DRIVES – 200k

Akhter	No	£189	+£2.50	MD202	
Chase Data	No	£174	inc	110	
	Yes	£204	inc	110	
Cumana	Yes	£294.95	extra	CD200	
Microdis	Yes	£239.20	inc	CD200	Cumana

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Single Drives 40/80 400K	
Single Drive	£129.00
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Drive + Acorn DFS	£205.00
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Dual drive + Viglen DFS	£319.00
Dual drive + Acorn DFS	£329.00
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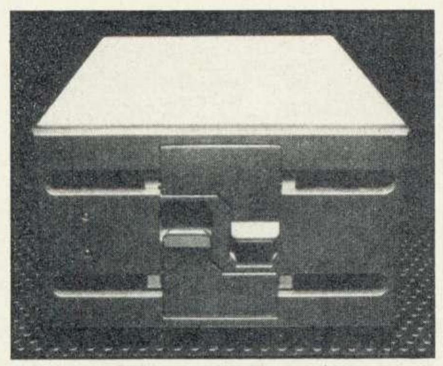
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unless you stand it on a sheet of foam. It comes complete with copious lengths of lead, a manual and a utilities disc.

If you have a DFS fitted and you want a twin drive, this could be your baby.

If you're looking for a complete package, ie, switchable drives and disc interface, then the current Viglen offer is worth looking at. It includes a single double-sided switchable drive, Acorn DNFS and utilities disc – all for £229.

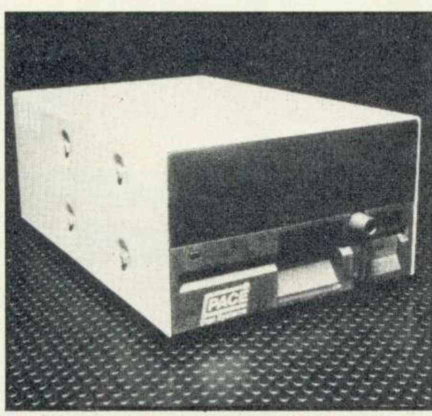


Data Track Technology: impressive

Finally, if money is no object then, at the very top of the range, the 800k 40/80 GCC drive is very elegant.

Wait and see

Although I've made these recommendations, I'd advise that you hang onto your cash for the time being. Reviews are personal affairs and you might ultimately disagree with me. As we go to press, the *Acorn User* Show is less than six weeks away, and will have around 120 exhibitors, many of whom I have mentioned above. It would be worthwhile making the trek to the Show to look at and test the drives for yourself. If past experience is anything to go by, price war is the name of the game at exhibitions, and by the last day you can get some very good discounts. Many retailers charge up to £12 carriage to dispatch a disc drive to you – for many readers this would cover the cost of a day in town, and at least you would go home more confident that you had made the right choice for yourself, and possibly a real cash saving.



Pace: single drive in a twin case

Supplier	PSU	Price	P&P	Order No.	Notes
Microworld	Yes	£269.95	inc	CD200	Cumana
Opus	Yes	£349.95	inc	5401D	
Pace	No	£238.05		PDD1	
Technomatic	No	£201.25	+£8	TD200	
	Yes	£230	+£8	PS200	
	No	£224.25	+£8	TD200P	Plinth version
	Yes	£233	+£8	PD200P	Plinth version
Twilstar	No	£189	+£8		PSU extra £29
Viglen	No	£238	+£12		
Watford	No	£189.75	+£7	CLD200	
	Yes	£235.75	+£7	CD200	

40-TRACK TWIN DOUBLE-SIDED DRIVES – 400k

Supplier	PSU	Price	P&P	Order No.	Notes
Akhter	No	£275	+£2.50	MD402	
Chase Data	No	£191	inc	210	
	Yes	£226	inc	210	
Cumana	Yes	£312.95	extra	CD400D	
Opus	Yes	£399.95	inc	5402D	
Pace	No	£180.55	extra	PDD4	
Twilstar	No	£299	+£8		
	Yes	£319	+£8		
Watford	No	£22[illegible]5	+£7	CLD400	
	Yes	£247.85	+£7	CD400	

80-TRACK DOUBLE-SIDED DRIVES – 400k

Supplier	PSU	Price	P&P	Order No.	Notes
Akhter	No	£175	£2.50	MD401	
Solidisk	No	£209.95	+£3		Includes DDFS which will give 40-track stepping
Twilstar	No	£159	+£8		
	Yes	£179	+£8		
Watford	No	£144.90	+£7	CLS400	
	Yes	£171.35	+£7	CL400	

80-TRACK TWIN DOUBLE-SIDED DRIVES – 800k

Supplier	PSU	Price	P&P	Order No.	Notes
Akhter	No	£349	+£2.50	MD801	
Solidisk	No	£359.95	+£3		Includes DDFS which will give 40-track stepping
Technomatic	No	£339.75	+£8	TD800P	Plinth version
	Yes	£362.25	+£8	PD800P	Plinth version
Torch	Yes				Power pack can support Beeb. Useful with CPN Z80
Twilstar	No	£318	+£8		
	Yes	£338	+£8		
Watford	No	£270.25	+£7	CLD800	
	Yes	£339.25	+£7	CD800	

40/80-TRACK SWITCHABLE SINGLE-SIDED DRIVES – 200k

Supplier	PSU	Price	P&P	Order No.	Notes
Cumana	Yes	£195.95	extra	C200	
	Yes	£180.95	extra	CS200E	No extras
	No	£159.95	extra	CSX200	
Pace	No	£164.45	extra	PSD5	
Viglen	No	£129	+£12		

40/80-TRACK TWIN SINGLE-SIDED DRIVES – 400k

Supplier	PSU	Price	P&P	Order No.	Notes
Cumana	Yes	£359.95	extra	CD400	
Microdis	Yes	£302.55	inc	CD400	Cumana drive
Pace	Yes	£319.70	extra	PDD5	
Viglen	No	£258	+£12		
	Yes	£307	+£12		

40/80-TRACK DOUBLE-SIDED DRIVES – 400k

Supplier	PSU	Price	P&P	Order No.	Notes
Akhter	No	£179	+£2.50	MD401	
Chase Data	No	£154	inc	221A	Canon
	Yes	£179	inc	221A	Canon
	No	£149	inc	220	Canon Slimline
	Yes	£174	inc	220	Canon Slimline
	No	£149	inc	596D	Sanyo
	Yes	£174	inc	596D	Sanyo
C Tech	No	£171.35	inc	55F	
Cumana	Yes	£188.95	inc	CS400	
	Yes	£179.95	inc	CS400E	No extras
	No	£158.95	inc	CSX400	
GCC	No	£170	extra		
Keyaki	Yes	£182.25	inc		
	No	£159.25	inc		Second drive to add to above unit with PSU
Microfast	Yes	£175	+£10		Opus drive
Microman	No	£189	inc	PSD	Pace drive
	Yes	£215.95	inc	CS400	Cumana drive
Microworld	Yes	£355	inc	CD400	Cumana drive

Addresses of suppliers

Akhter
28/29 Burnt Mill, Harlow, Essex CM20 2HU. Tel: (0279) 443521.

AMS
Advanced Memory Systems, Green Lane, Appleton, Warrington WA4 5NG. Tel: (0925) 62907.

Chase Data
Unit 2, Crabtree Road, Thorpe Industrial Estate, Egham, Surrey TW20 8RN. Tel: (0784) 38487.

C Tech Computers
184 Market Street, Hyde, Cheshire SK14 1EX. Tel: 061-366 7794.

Cumana
Pines Trading Estate, Broad Street, Guildford, Surrey GU3 3BH. Tel: (0483) 503121.

Data Track Technology
7 Queensway, Stem Lane Industrial Estate, New Milton, Hampshire BH25 5NN. Tel: (0425) 619650.

Electronequip
59 West Street, Fareham, Hants. Tel: (0329) 230671.

GCC
66 High Street, Sawston, Cambridge CB2 4BG. Tel: (0223) 835330.

GSL
2 North Way, Andover, Hampshire SP10 5AZ. Tel: (0264) 58744.

LVL
Regent House, Lenton Street, Sandiacre, Nottingham NG10 5DJ. Tel: (0602) 394000.

Keyaki
44 Terrace Road, Walton-on-Thames, Surrey KT12 2SD. Tel: (09322) 42777.

Microdis
46 Middle Street, Blackhall, Hartlepool, Cleveland TS27 4EA. Tel: (0783) 872430.

Microfast
57 Hoxton Square, London N1. Tel: 01-729 1778.

Microman
Rainford Industrial Estate, Mill Lane, Rainford, St Helens, Merseyside. Tel: (074488) 5242.

Microworld
4 St Andrew Square, Edinburgh EH2 2DB. Tel: 031-557 2087.

Midwich
Gilray Road, Diss, Norfolk IP22 3EU. Tel: (0379) 4131

Northern Micros
Churchfield Road, Frodsham, Cheshire WA6 6RD. Tel: (0928) 35110

Opus
55 Ormside Way, Holmethorpe Industrial Estate, Redhill, Surrey. Tel: (0737) 65080.

Pace
92 New Cross Street, Bradford BD5 8BS. Tel: (0274) 729306.

Solidisk
17 Sweyne Avenue, Southend-on-Sea, Essex SS2 6JQ. Tel: (0702) 354674.

Technomatic
17 Burnley Road, London NW10 1ED. Tel: 01-208 1177.

Supplier	PSU	Price	P&P	Order No	Notes
Midwich	No	£184	extra	BBC400	
	Yes	£213	extra	BBC400P	
	Yes	£282	extra	BBC400PI	Includes Disc Interface
Opus	No	£199.95	inc	5802	
Pace	No	£186.30	extra	PSD3	
Technomatic	No	£143.75	+£8	TS400	
	Yes	£171.35	+£8	PS400	
UCC	No	£259.95	inc	55F	Includes UDM interface
	No	£169.95	inc	UCL4080C	PSU £32.50 extra
Viglen	No	£169	+£12		
	Yes	£209	+£12		
Watford	No	£155.25	+£7	CLS400S	
	Yes	£136.85	+£7	CS100	

40/80-TRACK TWIN DOUBLE-SIDED DRIVES – 800k

Supplier	PSU	Price	P&P	Order No	Notes
Akhter	No	£359	+£2.50	MD800	
	Yes	£429	+£2.50	MD800P	Includes built-in monitor stand
Chase Data	No	£289	inc	221A	Canon
	Yes	£319	inc	221A	Canon
	No	£279	inc	220	Canon Slimline
	Yes	£309	inc	220	Canon Slimline
	No	£279	inc	596D	Sanyo
	Yes	£309	inc	596D	Sanyo
C Tech	No	£171.35	inc	55F	
Cumana	Yes	£356.95	extra	CS800/S	
GCC	Yes	£395	extra		
Microdis	Yes	£356.50	inc	CD800	
Microfast	Yes	£369	+£10		Opus
Microman	No	£359	inc	PDD3	Pace
	Yes	£414.95	inc	CD800	Cumana
Microworld	Yes	£399	inc	CD800	Cumana
Midwich	No	£333	extra	BBC400D	
	Yes	£368	extra	BBC400DP	
	Yes	£437	extra	BBC400DPI	Includes Disc Interface
Opus	Yes	£429.95	inc	5802D	
Pace	No	£347.30		PDD3	
Technomatic	No	£316.25	+£8	TD800	
	Yes	£345	+£8	PD800	
Viglen	No	£258	+£12		
	Yes	£307	+£12		
Watford	No	£309.35	+£7	CLD800S	
	Yes	£343.85	+£7	CD800	

3.5in DRIVES

Supplier	PSU	Price	P&P	Order No	Notes
Cumana	No	£139.95	extra	CSX351	40-track single-sided – 100k capacity
	No	£199.95	extra	CSX254	80-track double-sided – 400k capacity
	No	£256.95	extra	CDX358	Twin 40-track single-sided – 200k capacity
	No	£383.95	extra	CDX358	Twin 80-track double-sided – 800k capacity
Keyaki	Yes	£182.85	inc		40/80 switchable, double-sided – 400k
	No	£159.85	inc		As above, second drive

3in DRIVES

Supplier	PSU	Price	P&P	Order No	Notes
AMS	No				Single-sided drive – 100k capacity
	No				Twin single-sided drives – 200k capacity
	No				Double-sided drive – 200k capacity
	No				Twin double-sided drives – 400k capacity
Electronequip	No	£59.95			Single-sided drive – 80.64k capacity
GCC	No	£120			Single-sided drive – 100k capacity
Opus	No	£199.95			Double-sided drive – 200k capacity. Price inclusive of DDFS interface, gives 500k capacity

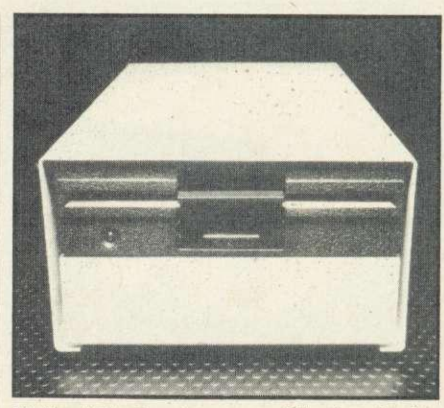
Torch
Abberley House, Great Shelford, Cambridge CB2 5LQ. Tel: (0223) 841000.

Twilstar
17 Regina Road, Southall, Middx UB2 5PL. Tel: 01-574 5271.

UCC
Unit 17/18, Bowling Court Industrial Estate, Bowling Back Lane, Bradford BD4 6BR.

Viglen
Unit 7, Trumpers Way, Hanwell W7 2QA. Tel: 01-843 9903.

Watford Electronics
250 High Street, Watford. Tel: (0923) 40588/37774.



Watford Electronics: competitively priced

ON THE MENU

Peter Rochford serves you up an automatic menu of a disc's contents

THIS IS a disc auto menu program and, as you will gather from the description that follows, it has some interesting and useful extra features. The beauty of an auto menu is that you can keep adding files until the disc is full, without ever having to alter the menu program.

The program has been written so that it will work with the Acorn, Watford and Amcom DFSs. It is possible that it will work with double density DFSs provided they have 8271 emulation and that the disc catalogue conforms to the Acorn standard.

On running the program, the screen will display the title of the current disc, a two-column list of the menu files with a letter for selection, a disc status report at the bottom of the screen along with the number of the current drive.

The disc status report gives the number of files and bytes free on the disc. In addition, if the disc can be compacted, a small blue flashing block will appear in the bottom left-hand corner. If this happens, pressing CTRL-C will cause a line to appear at the bottom of the screen, stating how much space will be gained by compacting the disc. Of course, strictly speaking, that space is already available provided a program will fit into it, but the bytes free figure before compacting does not include it.

You now have the option by single key press, of selecting for loading and auto-running any program displayed on screen. Before doing so, however, you have several options at your disposal. It is possible to select another drive by pressing 0,1,2 or 3. This will display the menu files on the disc in that drive, and then wait for a command.

Pressing CTRL-P will disable the screen and send to the printer (if one is connected) a copy of the disc title, a list of the files in the menu and a copy of the disc status. This is printed so that it should fit on to a small label which can be attached to the disc itself, or the sleeve. Even with the maximum number of 29 files (the other two being menu and !BOOT), if the label is stuck at the top of the disc most of the information can be read without removing the disc from its sleeve.

Before selecting a program from the menu, you can select to switch off the sound by pressing CTRL-Q. This is very handy for those games that do not have this option, eg, early Acornsoft games like *Snapper*, *Planetoid*, etc.

The program will distinguish between a file that has to be *RUN and one that requires CHAINing. Also, it will allow files that call another to be accommodated. How it does this is quite simple. All files that are CHAINed are put into the '+' directory and those that require *RUNning are put into the '−' directory. These are the only ones displayed on the screen menu.

All other files called from the displayed menu files are put into the '=' directory. This means that any combination of machine code and Basic files can be called, as the directory is set by the menu program to '=' when the first file is initiated. Whether the called file needs *RUNning, CHAINing, *LOADing or LOADing doesn't matter as this is decided by the calling file.

Those of you who have the Computer Concepts *Disc Doctor* ROM will probably recognise these protocols as the same used for the *MENU facility. I have purposely used the same system, so that anyone having that ROM can add this program to an existing disc easily and take advantage of the extra facilities.

If none of the files on the disc observe the correct protocols, or the disc is empty, a message will appear on screen. At this point you can exit the program by pressing Break, insert another disc in the current drive and then re-select that drive, or select another drive. If no disc title has been put on the disc, you will be reminded on screen.

The program works in mode 7 and the colours of the screen display were chosen to suit my own personal taste.

Once you have the program typed in correctly, create a !BOOT file on the selected disc consisting of:

```
PA.=&6900
CH."MENU"
```

Set the !BOOT option to *OPT 4,3 and save the menu program on to the disc. Now *RENAME the files on the disc you wish to appear in the menu in accordance with the information given earlier regarding directories. Now, on Shift-Break the program will auto-run and display your files ready for selection.

There may be a problem adding the program to an existing disc using the Acorn DFS, which you should be aware of. If you try to create a !BOOT file on a disc that was compacted without a !BOOT file present, you will get a 'Disc full' message. You have no choice then but to transfer the files to another disc.

A word of caution regarding the use, or rather abuse, of the program. If you try to select a drive other than those connected to the system the computer will lock up. Also, pressing CRTL-P without a printer connected will cause the system to lock up. Swapping the disc in the current drive after the menu has been displayed and then selecting a menu file will produce the same result. They won't cause any major disasters and the simple remedy is to press Break to restore control.

The program has been tested with various versions of the Acorn, Watford and Amcom DFSs. It has been used with up to 4 drives and using 40 and 80 track systems.

Program notes (listing 1)

All the numeric variables are resident integers for the sake of speed and disc space. The string variables are all single-letter, for the same reason.

A lot of the unnecessary spaces



could have been removed and multi-statement lines employed but it would sacrifice readability, so I leave it up to you to compact it after typing in.

When testing the program, don't forget that it will probably get overwritten by any file you call from it, so make sure you have a copy saved on disc. The error trapping in PROCerror will take care of stopping the program and reporting any problems – apart from what I term abuse, ie, selecting a drive not connected, swapping discs in the current drive and pressing CRTL-P without a printer connected. Every time you encounter an error, save a copy of the program after it has been corrected before proceeding.

Warning! Place a REM at the head of line 100 and when you are sure everything works fine, remove the REM and save the final working copy of the program to disc. The *FX 200,3 command not only disables the Escape key, but causes a memory wipe on hitting Break. I have included it for a reason which will take too much space to explain, but in certain situations it is necessary and so do not omit it.

The way the program works is quite straightforward. The first two sectors of the current disc are read in to RAM and the catalogue information they contain used to form a menu of the files on the disc. Once this has been done, the program enters a REPEAT . . . UNTIL loop at lines 170 to 230.

The various options are then tested for in that loop until a file is selected and the loop exited. *FX calls are then reset and at line 290 the first character of the filename (ie, the directory letter) is tested for.

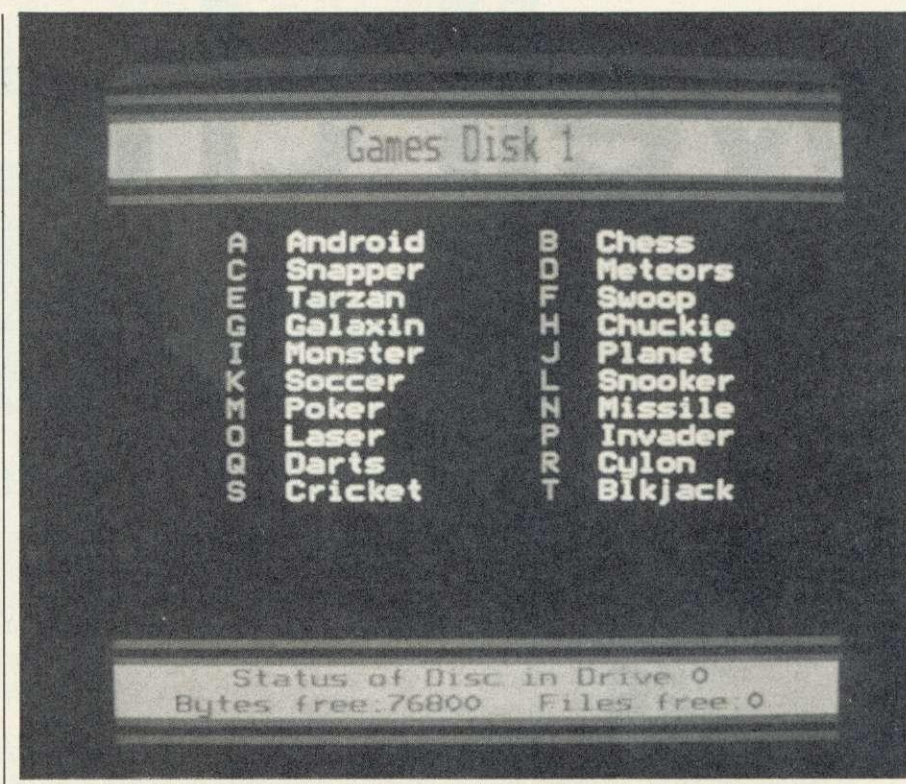
Should it be a minus sign, the program jumps to line 340 where the OSCLI routine is used to *RUN that file. If the first letter of the filename was a plus sign then the program is CHAINed at line 320. I should point out that the values of PAGE should be set at lines 310 and 370 to suit the default value for the DFS you are using.

For those who use an extended catalogue utility, it should be quite simple to incorporate a catalogue-swapping call into the program by inserting it into the main REPEAT . . . UNTIL loop and after the catalogues have been swapped, get the program to call PROCmainprog and then return to the loop.

PROCs

PROCmainprog – lines 410 to 480. This is the main section of the program which calls all the other procedures.

PROCreadsectors – lines 500 to 560. This reads the first two sectors of the current disc containing the catalogue information and places them high in RAM.



The program gives a two-column list of menu files with a letter for selection

PROCdisctitle – lines 580 to 720. This procedure checks that a disc title exists and if so prints it at the top of the screen in double height characters. If no disc title is found, a suitable message is displayed in its place.

PROCgetfiles – lines 740 to 870. This procedure establishes the number of files on the disc, gets all the component parts of the filenames and their directories, and puts them together. It then checks for all those files with a '–' or '+' directory and puts them into the array W$.

PROCdisplayfiles – lines 890 to 940. This checks first to see if any files exist in the correct directories to be displayed. If so, they are printed in two columns on screen along with a letter for key selection, otherwise a message is printed before exiting.

PROCdiscstatus – lines 960 to 1140. This is a modified version of a routine used in Robin Newman's *Fresect* program. (See May 84 issue of *Acorn User*). You should refer to that issue for a full explanation of how it works. Briefly and simply, it is responsible for calculating the first available sector on the disc, thus the number of bytes used. Then it adds up the length of all the files on disc and subtracts it from this figure to detect if the disc has space needing compacting.

PROCdrive – lines 1160 to 1200. This is responsible for changing the current drive to one selected by the user.

PROCshow – lines 1220 to 1270. This procedure is used to display the amount of space that may be gained after compacting the disc. The information is erased from the screen after a few seconds.

PROCprint – lines 1290 to 1430. *FX3,10 disables the screen and sends all further output to the printer. Note that there is no need to perform a VDU 2 after using this *FX command. Also there is no need to send VDU 1 before each control code sent to the printer. The control codes given in this routine are for an Epson MX80 F/T 3.

Line 1310 selects emphasised and enlarged print for one line.

Line 1330 resets the emphasised mode to normal and then selects condensed print.

Lines 1350 to 1400 print the menu filenames in five columns and then the disc status information.

Line 1410 resets the printer back to normal print ready for other use.

*FX 3,0 disables the printer and re-enables the screen.

PROCerror sets the ON ERROR to off, re-enables the screen in case the error occurred while disabled, resets the cursor keys and Escape key, selects mode 7 and REPORTs the error. This procedure also reports disc errors which are handled by flagging before the procedure is called and tested for at line 1510.

Peter Rochford's listing is on yellow pages 108–109

A few well chosen words

about the new SPEECH ROM for the BBC micro



The normal ACORN speech system allows the computer to speak a hundred or so pre-determined words. This is fine if you only want the computer to speak these words, but in practice it is extremely limiting.

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A unique feature of this package enables the pitch and the emphasis of words or parts of words to be changed. Because this is not normally possible, computer speech tends to have no expression. THE SPEECH ROM can emphasise a particular syllable and so re-enforce the meaning of a sentence. This feature also enables the computer to ask questions in a more realistic manner.

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BREAK AWAY

Mark Dove's program will close files left open if the Break key is pressed

THE BBC micro, when coupled with floppy disc drives, provides easy access to random access files from both Basic (using OPENIN, OPENUP and OPENOUT), and machine code (via OSFIND, OSBGET etc). However, one important point must be borne in mind when using random access files – a copy of the currently accessed sector (256 bytes) is held in memory where changes are made to it, and is only saved back to the disc when a new sector is needed, or a CLOSE command is executed.

This system works extremely well, and means that the disc is not accessed for every byte of data, but only for complete blocks of 256 bytes, giving a considerable time saving. It must always be remembered when writing data, however, that the last values written to the file are only present in memory, not on the disc. The command CLOSE, or the equivalent OSFIND call, is necessary to save this last piece of data, and ensure that the length of the data file is correctly set.

Although it's easy to write a program which will automatically CLOSE any open files if the Escape key is pressed or some other error occurs, it's extremely difficult to accomplish the same feat should the Break key be pressed. Obviously, when writing business software or programs to be used by people unfamiliar with the Beeb, it's inevitable that Break will be pressed by accident, and any data still in the machine, but not on disc, will be lost. The solution appears to be:

```
*KEY 10 CLOSE#0¦M
```

but this fails due to Break reinitialising the DFS, which means resetting its internal pointers to the random access files. This rules out the use of Basic for our purposes.

To produce a solution we must divert the operating system during its 'tidying up' after Break, and make it execute our program. We must also make sure that it does this before initialising the DFS. Luckily, provision for just this type of situation is made in the form of a *FX command: *FX247.

This command, along with *FX248 and *FX249, specifies a machine code JMP instruction (machine code GOTO), which is executed by the operating system after Break. By intercepting this call we can redirect it to our machine code to close any open files.

If you are unfamiliar with machine code, then simply type in the program (listing 1), and SAVE a copy of this 'source code' with filename "SOURCE". This is written in Basic and assembly language, and is consequently easier to change at a later date than pure machine code. Then RUN and, all being well, the display will show:

```
Filename for machine code:
```

This 'object code' will now be saved, and to use it in your own program simply insert the following lines:

```
*LOAD filename
 CALL &900
```

or more simply:

```
*RUN filename.
```

The next time Break is pressed any open files will be properly closed, and the *FX247 command deleted. Although nothing will happen if this is not done, *FX247 survives even a hard reset. If the object code is subsequently overwritten the machine will 'crash' the next time Break is pressed, and will need to be turned off. If the object code is loaded every time the Basic program is Run (as suggested above), then *KEY 10 can be used to re-enter the program and everything will run smoothly.

The following paragraphs are intended to explain the program to the more technically minded, as extensive use is made of the 8271 Floppy Disc Controller chip, which is undocumented in most books. It's necessary to access this chip since it will have been reset on Break, and needs to be set up according to the disc drives in use.

Lines 230 to 400 set up *FX247 to point to the code which closes the files, and also saves a copy of the filing system vectors which will have been reset to *TAPE on Break. When a reset occurs the code from line 450 onwards will be executed, first with the carry flag clear, and afterwards with it set. We want to intercept Break before the paged ROMs are executed and so we use the carry clear option.

Next the filing system vectors are replaced so the OSFIND can be called, then *FX247 is cleared (lines 550-580) to prevent further interceptions.

A call to OSBYTE with A=&FF is used to determine the position of the keyboard links, which govern stepping speed for the disc drives. According to these links the data held in lines 1050, 1060, 1070 or 1080 is sent to the 8271 in the following fashion: &35 is stored in &FE80, the command register, which informs the 8271 that a 'SPECIFY' command is required. Further data is sent to &FE81, the parameter register, to set the track-to-track stepping rate, the head settle time, the head load time, and the number of revolutions of the disc before the motor is turned off.

The same format is used by lines 1090 and 1100 which set the location of 'Bad Tracks' on each drive. This facility of the 8271 is not used by Acorn and so the values are 255 in each case.

Line 1110 provides the data to set the mode of operation of the 8271 – &3A is the command for 'WRITE SPECIAL REGISTER' and there are several of these; &17 is the mode register. This is set to double actuation of the disc head, and non-DMA (Direct Memory Access) operation.

This setting up of the 8271 is needed to avoid a "Drive Fault" error message due to the default settings of the 8271 being incompatible with the BBC micro's use of the disc drives.

Once this has been done, lines 780 to 800 perform the machine code equivalent of CLOSE#0 calling OSFIND. This closes any open files, and then returns to the operating system to continue resetting of the computer.

The direct access of &FE80 and &FE81 will not need to be changed as *FX247 will only be executed in the input/output processor. To check the program, *RUN the object code and type the following Basic commands:

```
X=OPENOUT("TEST")
PRINT #X,"THIS IS A TEST"
```

Now press Break and note that the disc drive turns on for a short time before the normal display reappears. If the machine locks up, then turn off and check the source code for possible typing errors. If all is well type:

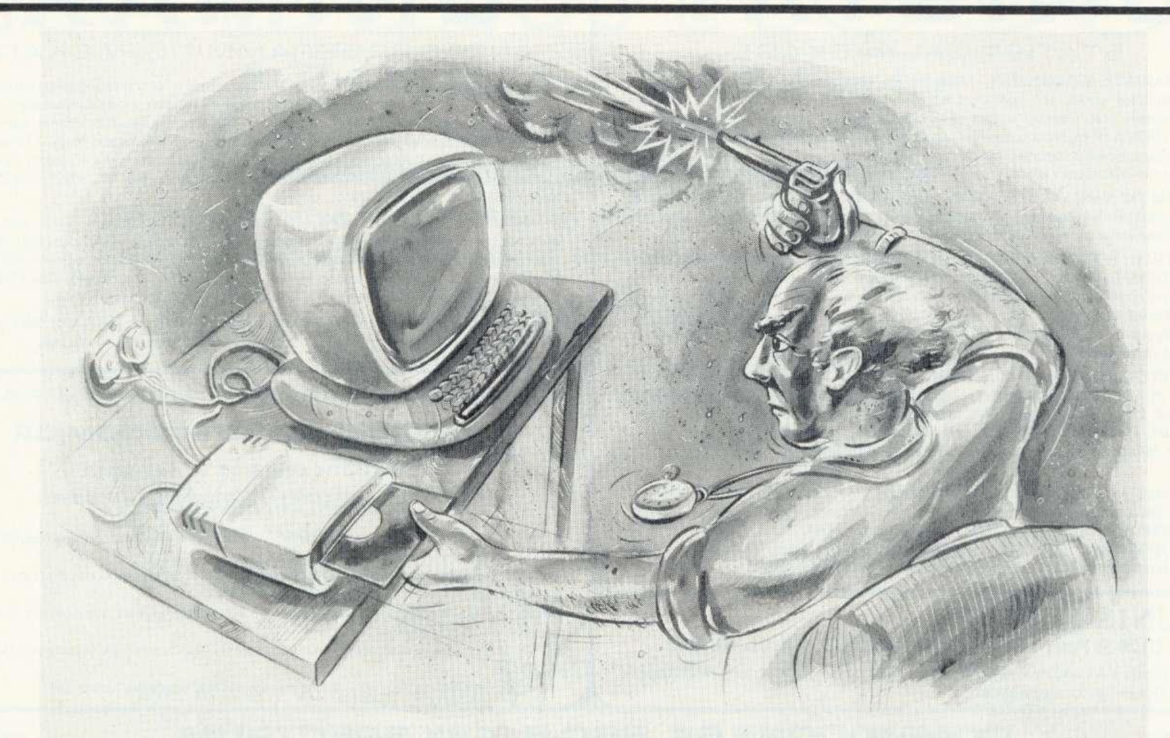
```
X=OPENIN("TEST")
INPUT #X,A$
PRINT A$
```

As you will see, the file now has been properly closed.

You'll find Mark Dove's listing on yellow page 110

ILLUSTRATION BY GARY WING





SPEED READING

For a faster disc system, incorporate Nick Davies' procedures to speed up the processing of data files

WHEN you bought your disc drives, you probably thought you'd never again be worried about the speed of reading and writing data files. Certainly, disc drives are always faster than tape, no matter what you are doing with them, but as the amount of data you want to keep in a file on disc increases, so does the time it takes to run a program to process that data. Now, a few minutes isn't too bad, but when a program takes half-an-hour to run, it's worthwhile seeing if there are any ways of making it run any faster.

I'll present some procedures to speed up the processing of data files. In one example, by using these procedures, I was able to reduce the execution time of a program from 30 minutes to 15 minutes – a worthwhile saving for a small amount of extra program code.

If we want to improve program speed, we need to look at the slowest parts of the program, as improvements made here will have the most effect on overall speed. The slow parts of programs doing disc I/O are when the heads are moving from track to track between files, and when we have to switch between two different drives.

Let's consider a couple of examples to illustrate this. In a program that reads one file and writes out data to create another file, the sequence of events is:

a. Open first file
b. Open second file
c. Read first file
d. Write second file
e. Close first file
f. Close second file

Items c and d will be repeated as many times as necessary to process all the data in the first file. Between reading a record from file 1 and writing a record to file 2, the disc heads must move between the two files. Then the heads must move back to file 1 for the next read. Accordingly, the disc heads are potentially spending a lot of time moving back and forth between two areas of the disc, and compared to the speed of the micro, this is slow.

This is a simplified view of the way the DFS works, because in reality the unit of data transfer between disc and memory is the sector, which is 256 bytes long. The principle is the same, though – every 256 bytes, the disc heads have to jump back and forth between files.

Clearly, the impact of this seek time (as this head movement time is known) is dependent on the distance between the two files. Reducing the seek time is one way in which we can improve performance, and I'll look at how this can be done later.

Another example is a program that reads a file from a disc in one drive and writes it to a disc in another. There are two different cases to consider. One possibility is that the two drives are 0 and 2, ie, two sides of one disc. This case is substantially the same as the previous example, because the heads for both sides of a double-sided drive move together, so there is seek time when we switch between files on the two sides.

The other possibility is that we are using drives 0 and 1; separate physical discs. In this case, we have to wait for a drive to spin up to speed when we switch between files.

The only programs whose performance can be improved by the techniques in this article are those that access two or more files. In these cases, the objective is to reduce inter-

ILLUSTRATION BY GARY WING

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drive switching and seek time. The way to achieve this is to reduce the number of times we switch between files by transferring more data each time we access a particular file, ie, to buffer the data in memory. The DFS buffers in units of sectors, but by a little additional programming, we can easily buffer any amount of data we wish.

How to speed things up

Consider a simple program that reads some data, then writes it out to a different file. Instead of writing out to a second file, think about what will happen if we 'write' the data to part of memory we have set aside for this purpose. Now, the disc drive is only accessing one file at a time as we read records, and the output file data is accumulating in memory. At some time our buffer area will fill up, so we must then write this data physically to the output file.

We are still switching between two files, but are only doing so a fraction as often as before. If we allocate, say, 3k to our buffer area, we shall switch between files only about a tenth as often as if we relied on the DFS buffering of 256 bytes per file. This technique is of equal value whether we have files on one disc or on two different discs.

There are two methods of programming to provide this buffering. We can buffer the input file in memory, or we can buffer the output file. The procedures listed below are to buffer the output file. The reason for choosing this option is that the program needs to be more complex to buffer the input file, and we would then gain less benefit from making the program run faster.

If you have a program that reads two input files, with no output, then you may find it useful to adapt these procedures to handle input file buffering.

For programs that use more than two files, the procedures will need small modifications – for example, to use differently named buffer areas for different files that are being buffered.

There are two types of file that we may want to handle. One consists of a set of Basic strings. Such a file will have been created by statements such as:

```
PRINT#n%,a$
```

The other type of file is just a set of ASCII characters. This is the form in which *Wordwise* and *View* store data on disc, and can also be created from a Basic program by code such as:

```
BPUT#n%,a%
```

In practice, I have found that there is far more benefit to be gained from improving the performance of string files than of ASCII files so I will only discuss string files from now on. If you wish to experiment with similar techniques for ASCII files, it's a fairly simple matter to adapt the procedures I've listed.

The functions we need to provide to handle the buffering of a file are:

1) Open the file. This corresponds to the OPENOUT function in Basic. This involves telling the DFS that we want to use the file, and setting up a buffer area to hold the data we are going to accumulate in memory.

2) Write to the file, ie, replace the PRINT# statement of Basic by a function call that writes the data away to our buffer area. We will need to check if the buffer has filled up, and if so, write it away to disc.

3) Close the file, corresponding to Basic's CLOSE#, where we write any data that is left in the buffer to the disc, and then close the file.

Procedures 1, 2 and 3 respectively provide these functions for string files (created by PRINT). I'll describe how these procedures work, and then explain the sample program that uses them to speed up the use of string files.

1. OPEN FN_VOPENOUT takes as parameters the name of file to be opened, the maximum length of string that will be written to the file, and the number of strings we want to hold in the buffer. We DIM a string array called buffer$, and preallocate each element to the maximum length of string that it will have to hold. This is to avoid the problem of BBC Basic losing memory because of the way it handles strings.

The purpose of the line 'numrec% = numrecs%' is that numrecs% is passed as a parameter to the function and is therefore a local variable, but the subsequent procedures need to know the size of the buffer, and use numrec% for this purpose. It's neater to set up numrec% in this way than to define it in the main part of the program. numrecs% can be varied depending on how much memory you have free. For best performance it should be set as high as possible.

The file handle is passed back from the function in the same way as from OPENOUT.

2. PRINT The second function that has to be provided is writing to the buffer. This is done by PROC_VPRINT.

The parameters passed are the file handle and the string to be printed. We save the string into the buffer array, and test to see if the array is full. If it is, we write the buffer out to the disc, zero recptr% so that we start from the beginning of the buffer on the next call to VPRINT, and exit. Note that array element zero of buffer$ is not used. This is to simplify the program logic.

3. CLOSE The final function is closing the file, and the procedure to use is VCLOSE. The only parameter this time is the file handle. If there are any strings in the buffer they are written to the file, and then the file is closed.

If you're writing programs of your own that process large amounts of data in string files, then you'll almost certainly be able to get performance improvements by using these procedures. If you decide to do so, I suggest you start out by writing your program without using file buffering, and then, when the program is fully tested and working, add in these procedures. This makes debugging of the main program much simpler.

An easy way to do this is to write your program using the following function and procedures rather than the standard Basic statements.

```
10000 DEFFN_VOPENOUT(fil$,recl
en%,numrecs%)
10010 LOCAL h%
10020 h%=OPENOUT (fil$)
10030 =h%

10120 DEFPROC_VPRINT(h%,a$)
10130 PRINT #h%,a$
10140 ENDPROC

10220 DEFPROC_VCLOSE(h%)
10230 CLOSE #h%
10240 ENDPROC
```

Then, once the logic of your program is correct, it's a simple matter to replace the dummy procedures above by the full procedures, and gain the benefit of faster execution. It's much simpler just to change three procedures than to have to go right through a program changing all occurrences of OPENOUT, PRINT# and CLOSE to procedure calls.

Also, if you wait until the program is finished, you'll have a better idea of how much memory you have free to use as buffer space.

The sample programs

These are intended to show the improvements in speed that can be gained by using these procedures. Listing 1 is intended to create string files for you to use listing 2 with. It will ask for a file name and how many strings are to be written to the file.

Listing 2 will ask whether you want it to work 'Fast or Slow'. Depending on whether you answer F or S, it will either use these new procedures or the standard Basic file handling statements. It will also ask for the names of the input and output files. Try running it against a 1000 string file with the input and output files on different discs – you should see a significant increase in speed with the 'Fast' version.

Nick Davies' listings to help you speed up your disc system are on yellow page 111

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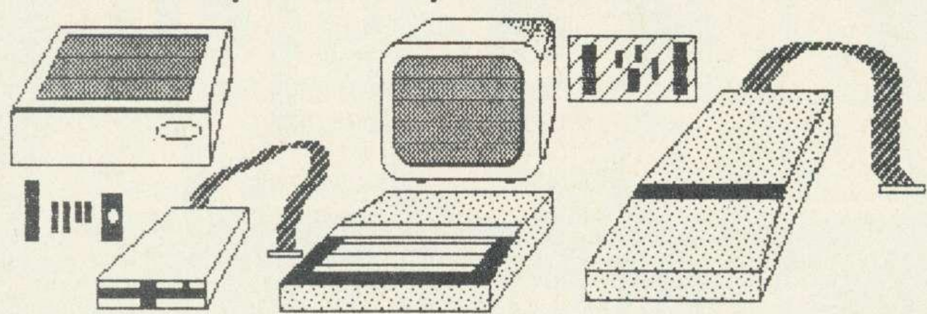


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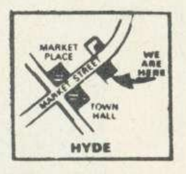
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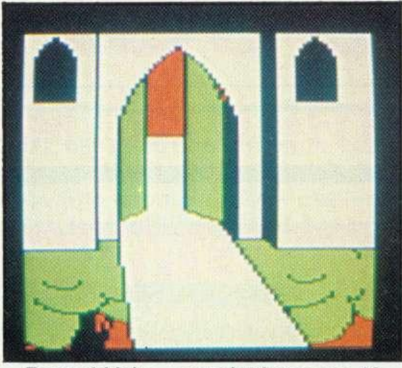
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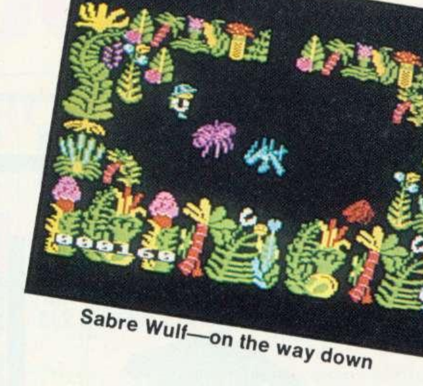


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Scrabble—a good score at no. 17


Emerald Isle—parachuting to no. 19


Sabre Wulf—on the way down

GAMES TOP 20

		TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1	(-)	Brian Jacks Superstar	Durrell	£7.95	B/E	
2	(1)	Castle Quest	Micro Power	£12.95 (£14.95)	B	March '85
3	(2)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
4	(3)	Combat Lynx	Durrell	£8.75	B/E	
5	(-)	Wizardore	Imagine	£7.95	B	
6	(-)	Gremlins	Adventure International	£7.95	B/E	
7	(5)	Tempest	Superior	£9.95 (£11.95)	B/E	
8	(6)	Football Manager	Addictive	£7.95	B/E	March '85
9	(4)	Sabre Wulf	Ultimate	£9.95	B	July '85
10	(11)	Labyrynth	Acornsoft	£9.95 (£11.50)	B/E	
11	(15)	Pole Position	Atarisoft	£9.99	B	March '85
12	(19)	Frak!	Aardvark	£8.90	B	September '84
13	(9)	Blockbusters	Macsen	£7.95	B/E	
14	(10)	Caveman Capers	Icon	£7.95	B/E	
15	(8)	Tales of Arabian Nights	Interceptor	£6	B/E	
16	(12)	Eddie Kidd's Jump Challenge	Martech	£7.95	B/E	March '85
17	(13)	Scrabble	Leisure Genius	£12.95 (£14.95)	B	July '85
18	(17)	3D Grand Prix	Software Invasion	£9.95 (£11.95)	B	February '85
19	(7)	Emerald Isle	Level 9	£6.95	B	June '85
20	(-)	Hunchback	Ocean	£6.90	B/E	December '84

B = BBC. E = Electron. Prices in brackets are for disc versions. Compiled by RAM/Computer.

EDUCATION TOP 10

1	Podd	ASK	£9·95 (£11.50)	B/E	
2	Mr T (series)	Good Housekeeping	£9·95	B/E	January '84
3	Music System	Island Logic	£29.95		
4	Number Painter	ASK	£9.95 (£11.50)	B/E	March '85
5	First Steps	Mirrorsoft	£8.95 (£11.95)	B/E	
6	Here and There	Mirrorsoft	£7.95 (£10.95)	B/E	
7	Words Words Words	ASK	£9.95 (£11.50)		
8	French Mistress A&B	Kosmos	£8.95		November '84
9	Print Master	Computer Concepts	£33.35	(ROM)	
10	Maths Skill	Griffin	£11.95		

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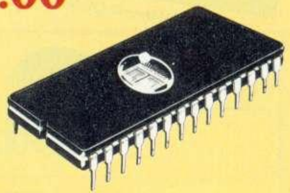
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Revving up at Silverstone

'Revs', Acornsoft, BBC (B, B+), £14.95 (disc £17.95)

REVS isn't the banger-racing type of Grand Prix game with spectacular explosions when you spin off, and scenery from a spaghetti western. It's a serious attempt to model a Formula 3 racing car by Geoff Crammond, with the attention to detail and style he invented for Acornsoft on *Aviator*.

It's not cheap, but Acornsoft has gone for quality with an excellent game



which is very well put together, and documentation to match.

The game owes its existence to Acorn's sponsorship last year of the Eddie Jordan racing team at Formula 3 level.

David Hunt, who drove the very car modelled here, was the test bed for Crammond's code and provided many of the comments in the 'driver's manual' and racing programme.

You can approach this game on two levels – as an F3 simulation at the Silverstone race track and a game. Having tackled Silverstone in just such a car, I can say that the *Revs* version goes out of control and spins just like the real thing (and having done a lot of spinning I should know!). Hunt reckons his best lap time on *Revs* is just 0.3 seconds faster than the real thing.

There is a software 'hook' so new tracks can be included, but there are no definite plans to make use of this.

Where the detail really shows is in things like the rear-view mirror's revealing other racers coming up behind, and the thump-thump as the car runs on the corner kerbs.

When it comes to controlling the car, the keyboard is a handfull, but worth persevering with. There are four keys in regular use for the left hand, and three for the right (come back *Elite*, all is forgiven). The game does work with joysticks, and was tested on the B+.

As a game, it lacks the unrealistic whizz, bang and crash of some, but this in no way diminishes its appeal, and those who appreciated the challenges of *Aviator* and *Elite* will find *Revs* in the same mould.

Tony Quinn

Beware of the Wulf

'Sabre Wulf', Ultimate, The Green, Ashby-de-la-Zouch, Leics LE6 5JU, BBC B, £9.95

ONE of the better Spectrum games, *Sabre Wulf*, has now been released for the BBC micro by Ultimate, and it's already high in the software charts.

The idea is to collect four pieces of a shield and take them to a cave, but there are a variety of animals, such as snakes, hippos, spiders and birds determined to stop you. There are also natives, and a Sabre Wulf, who lives near the mountains at the bottom of the map.

Other features are various pieces of treasure, worth only points, extra-life plants and flowers with various effects – speeding you up, slowing you down, reversing the controls, killing everything on the screen, and reversing the effects of the others.

There are a multitude of rooms in the maze, and without a map it should take



you a long time to complete the adventure. The pieces of the shield are positioned fairly randomly, but the rooms often look similar.

When you have finished your quest, or used up all your lives, you are awarded a score, and a percentage. The latter is an indication of the number of rooms you have visited, so you can finish on less than 100 per cent.

Graphic quality is excellent, with very good use of colour, and a superb selection of flora and fauna to navigate. Movement is smooth, although two characters flicker if superimposed. There is a wide variety of creatures, and altogether the graphics are well above average.

All in all, *Sabre Wulf* is an excellent game and very well worth the money.

Stuart Menges

Triple word score for Scrabble

'Scrabble', Leisure Genius, BBC B, £12.95 (disc £14.95)

THERE'S always been one problem with Scrabble – you need someone to play against. Leisure Genius has solved that problem with this game and it's got me hooked!

On entering the game you can choose up to four players and indicate whether these are played by the computer or not. There are four levels of play and these determine how long the micro thinks about each move.

The colour of either the board or its squares can be changed by pressing the function keys (f1/f2). If you need reminding of the distribution of letters or their values, this information can be obtained from the options menu. The screen displays the rack of letters and allows the user to enter his word. To help you form a word, the letters on the rack can be juggled around by pressing the f0 function key.



When playing the micro as an opponent, you're given the opportunity to view the machine's rack if you want while it thinks out its move. Entering a word on the board is straightforward – you just place the cursor (using the cursor keys) on the square where the word begins and indicate whether the word is placed across or down the board. The micro then informs you how many points the word scores and gives the choice of either accepting or rejecting that word.

The machine has a wide vocabulary and will only question your move when the word isn't in its dictionary. If that happens you have to inform the machine whether it is to accept the word or not – an opportunity for cheats!

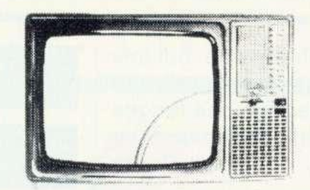
Overall I was delighted with *Scrabble* and the software is more than competent. Full marks and a triple word score to Leisure Genius for this implementation.

Jeremy Vine

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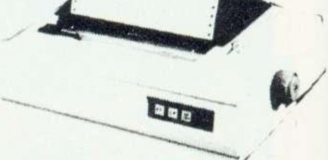
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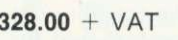
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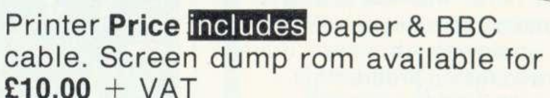
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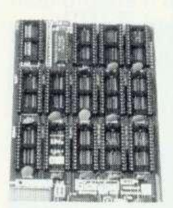


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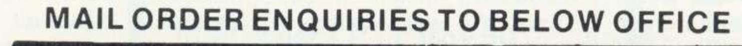
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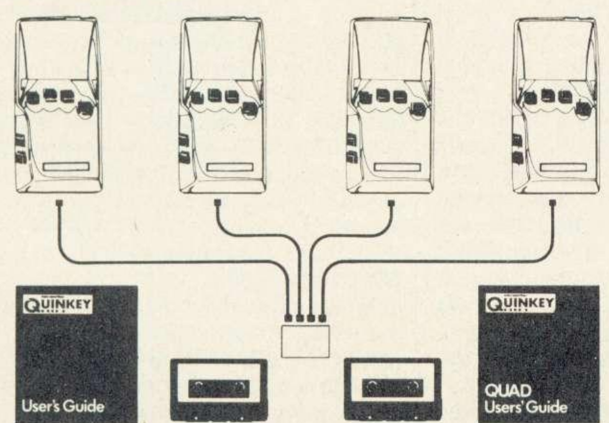
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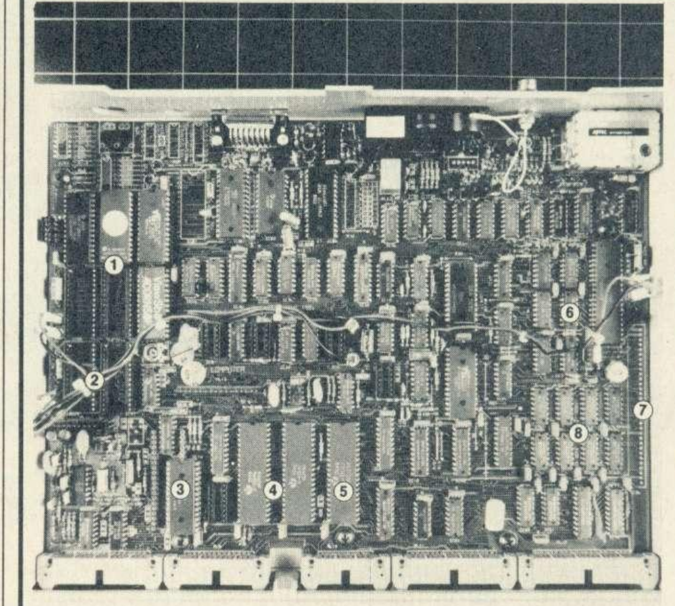
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B+ GRADING

Bruce Smith lifts the lid on Acorn's latest micro and peeks inside



What's new under the lid of the B+

It finally arrived last month – the long-awaited new BBC micro from Acorn – as predicted in the March issue of *Acorn User*. Acorn claims this is not a 'new' machine but merely a replacement for the ageing model B. However, even the most cursory of glances under the bonnet reveals that the main circuit board (PCB) has been totally redesigned, and not just rehashed. By calling this micro B+, Acorn has undoubtedly left the stage door open for the arrival of *the* new machine, possibly towards the end of this year – but more on that later.

The B+ seems to have been conceived at the start of 1984, when the only major redevelopment planned was the addition of two extra sideways ROM sockets. However, standard RAM memory chips were becoming increasingly sparse, along with the 8271 disc controller, so the more popular higher capacity RAMs were included, as was the more versatile 1770 disc controller chip.

Pre-production models were under test by last summer, and there is little doubt that poor sales of the model B during this period prohibited the arrival of the B+ for Christmas.

Externally the B and B+ are the same, it is only by switching the machine on that the new configuration is apparent. It announces itself as Acorn OS 64k, Acorn 1770 DFS. Taking the lid off exposes the new goodies. The first thing to notice is that, with the exception of the six sideways ROM sockets and the 1770, all chips are now soldered directly onto the main printed circuit board. The PCB itself is very neatly designed with regimentally arranged banks of chips. The other noticeable feature is the increased number of customised Programmable Logic Arrays (PLAs), which are very cost-effective.

The inclusion of a 6512, though fully compatible with the 6502, should allow improved second processor performance because of its improved clock drive circuitry.

The differences in hardware between the B and B+ are the sideways ROM sockets, increased memory capacity and the new disc interface that comes as standard. Let's look at each in turn.

Sideways ROMs

There are now six sideways ROM sockets. Each is capable of holding either 8k, 16k or 32k chips giving a possible total capacity of 192k.

The sockets are arranged in two rows of three at the top left-hand side of the board. I initially thought this was a much nicer arrangement than having them tucked away under the keyboard, but it soon became apparent that removing ROMs from their individual sockets was more difficult as the rows are flanked on top and bottom sides by the back portion of the case and the keyboard.

Basic and the MOS have been incorporated into a single 32k ROM under the title of OSBasic. The MOS version 1.2 plus a few extra functions built in, and now called 2.0. Basic 2 is supplied as the standard language. DFS 2.0 is present, also as standard and is described below in more detail.

OSBasic is normally selected as the priority ROM and as such is numbered 15 and 14. However, to allow other languages to have priority, a new link on the board, S13, may be repositioned to decode OSBasic as ROMs 0 and 1. This avoids the need to rejuggle ROM positions and is a nice touch.

There is no provision for ROM sockets 12 and 13, and remaining ROM sockets are initially set up to receive 8k or 16k ROMs. By resetting a nearby line of links, the sockets can be configured individually to accept 32k ROM firmware. Thus *View* and *Viewsheet*, or ISO Pascal could be combined onto a single chip and would be seen by the MOS as two 16k images.

Memory Map

The B+ memory map remains the same, ie, mapped as 32k RAM. The remaining 32k of RAM is arranged as 20k of shadow screen memory and 12k of sideways RAM as follows:

20k Shadow screen : &3000 – &7FFF
12k Sideways RAM : &8000 – &AFFF

The shadow screen memory effectively releases the whole of the normal memory, ie, &1900 to &7FFF, for user programs. The new 20k provides the video memory, thus making high resolution screen modes available to even the longest programs. Those of you familiar with the excellent Aries B20 board will know that this has been available for the standard B for well over a year.

When the B+ is switched on the shadow RAM is ignored by the MOS and for all intents and purposes the micro is the same as the B. The command *SHADOW is used to overlay the shadow RAM – however, it will only become functional on the next mode change. This condition is protected through Break but not a CTRL-Break: the shadow RAM may be software deselected with the command *SHADOW 1, followed by a mode change. Seven new mode parameters are provided to perform a *SHADOW n and mode change in one fell swoop: modes 128 to 135 relate directly to modes 0 to 8.

The 12k sideways RAM was implemented to use up the remainder of the 32k of extra RAM. Acorn says this should not be used for 'applications that may need to be compatible with future Acorn products' – presumably it won't be present in any model C. This is a shame as it's a most useful feature and, for my money, a good selling point.

This neglect towards the sideways RAM is apparent in the new Electron-style User Guide, where only two paragraphs mention it – it's not even included in the index! The sideways RAM will not run any ROM software as the MOS does not recognise it for this purpose, which is a shame. While I can fully understand the concern with ROM piracy, it is surely the way ahead. If effective licencing agreements were provided, the need for numerous ROM sockets would be decreased, thus reducing the end-user price.

Using the sideways RAM is cumbersome and relies on use of OSWORD 5 and 6 calls to read and write to it. The area can be used effectively as a data store for Basic programs or to run machine code programs.

Disc Interface

The disc interface is built around the Western Digital 1770 floppy disc controller. This is largely compatible with the Intel 8271, which was the standard up until now, and I've had no problems running the latest software using it. The 1770 is the only other chip socketed on the board, a deliberate move to allow you to insert an 8271 into a socket that straddles that of the 1770.

The DFS is version 2.0, in EPROM on my machine but should be in ROM for production models. The DFS is as it was, but includes several new commands. These include the previously missing format and verify, *FORM and *VERIFY. The other new commands are *CLOSE (close all sequential files); *EX (display directory information); *FREE (space remaining on disc); *MAP (provides a map of the disc); and *ROMS (lists details of ROMs fitted). The *DRIVE command has been modified nicely to allow software controlled double stepping. For example, the command *DRIVE 1 40 would switch drive 1 of an 80-track drive to read 40 tracks. Unfortunately it's not possible to write to a 40-track disc in this manner.

In addition, the DFS ROM also includes the Tube code for use with a second processor.

The Advanced Disc Filing System (ADFS) supplied with Acorn's Winchester hard disc will run the 1770 correctly and allows you to use it to its full potential as a double density disc controller. Acorn will probably be marketing this for the B+ in the future.

Compatibility

Although a new floppy disc controller chip has been designed into the B+ board, maintaining software compatibility has been a prime consideration. As such, the 1770 is only used in its single density mode, which means the machine should fit straight into schools without the need to re-hash existing software. A double density DFS such as the ADFS may be a future development.

The 6502 second processor will work fine, although the extra shadow RAM is of no real use as it will exist in the input/output processor.

Acorn is discussing the possibility of swapping a standard BBC B printed circuit board for the new one. This upgrade would have to be done through dealers, and is likely to cost £250 to £300, so would not be cheap.

Software

Most Acornsoft disc-based software runs OK, but *Elite* would not work: it simply returns the absurd message 'This is not a BBC micro' – well, you live and learn! However, the same cannot be said for other commercial software. For example, Micro Power's *Castle Quest* did not load, neither did *3D Grand Prix* from Software Invasion, nor *Fortress* from Pace. This is probably due to the disc protection methods used rather than the software itself.

But surprise, surprise, the screen handling on *View* 2.1 does not work correctly with shadow RAM, which must be most embarrassing to Acorn and Acornsoft; version 1.4 does work, however.

The trouble lies in the setting of HIMEM – *View* 2.1 was written specifically for the American market, and when in shadow mode the firmware thinks it's a Yankee. It therefore resets its text windows which means scrolling up through text is done on a single line! Acorn have provided a patch program to solve this which is given in listing 1, page 112. Neither *Wordwise* nor *Wordwise Plus* work in shadow mode.

Is it worth it?

My own view is that the B+ is 18 months too late. However, Acorn has sat on its laurels for the past two years rather than persuing an aggressive path of design and development. The ridiculous price tag of £499 will put it beyond the hobbyist, and possibly educational establishments too. Existing BBC owners should not consider parting with their cash in this way. If you want extra facilities, invest in the B20 board and the *Acorn User* UserRAM. If you're looking for a BBC micro, then the B+ may be worth considering as stocks of the BBC B will be diminishing and shortly become non-existent: but only if the price comes down to a more reasonable level.

The future

The B+ must be seen as a stop gap, pending the arrival of a model C. What such a micro will contain is still conjecture, but guesswork would lead me to believe that Acorn will persist with outdated eight-bit technology, albeit very fast at around 12MHz, and easy to program. This is obviously to allow the upward compatibility the BBC project stands for. The 16-bit 65C816, a 6502 lookalike, seems to be out of favour at present, though it does form the heart of the Communicator, and Acorn has never shown interest in anything as exciting as the 68000.

Eight bits would dictate a memory map arrangement similar to that of the B+ although possibly with paged RAM banks expanding the total to 128k. Working towards a complete PLA system would drastically reduce production costs by doing away with costly TTL chips.

I would expect the MOS to have been re-written and to be much more user friendly, with replacement of *FX operations with proper command names, eg, *LINEFEED for *FX6. In addition, Basic might have extra goodies such as an on-screen program editor similar to that found with Pascal.

Only time will tell, but I won't be planning my Christmas presents quite yet!

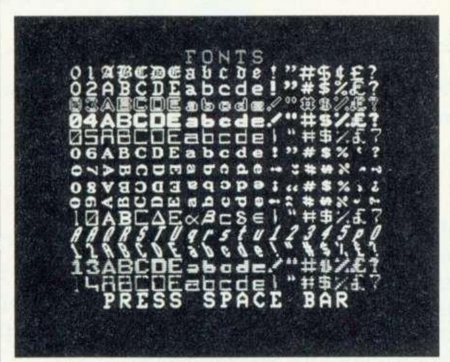
Vintage Characters

'Hershey Characters Font Generator', Beebugsoft, PO Box 50, St Albans, Herts, £10 (disc £15)

WHILE the in-built character set on the BBC micro is sufficient for the majority of applications where the main requirement is that the text be as legible as possible, eg, program listings, word processing, data display, there are some occasions where larger and alternative text fonts are desirable. Additional characters are fairly easily created using the VDU 23, . . . command to define ASCII codes 224 to 255 or to redefine existing characters whose codes lie in the range 32 to 126.

There is, however, a limit to the amount of detail which can be defined on an 8 × 8 matrix. The size of character as displayed on the screen will similarly be limited by the matrix and the width will depend upon the graphics mode in which it is displayed. It's not too difficult to devise a routine which will display larger characters by repeating pixels both horizontally and vertically, but the lack of detail is then made more prominent.

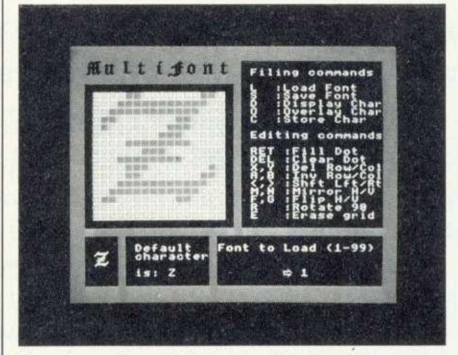
Hershey Characters from Beebugsoft is a font generator package supplied on either disc or cassette which takes a different approach to generating high resolution characters. The result is an extremely flexible way of creating high quality text (and other) displays. Instead of being defined as a series of dots, each character is encoded as a series of plot vectors, ie,



Multifont offers 14 fonts

as a series of lines. Moreover, each character has been defined within an 85 × 85 grid; consequently a large range of display sizes is possible with little or no loss of definition, and changing the display to another graphics mode does not affect the size of the text. The advantage of having so much detail encoded is most apparent when enlarging characters which contain curves and when displaying the more baroque fonts, such as gothic. A further advantage of this method of encoding is that characters can be rotated.

The package contains nearly 1600 pre-defined characters in nine different fonts. Text styles available are Sans Serif, Cursive Script (looks like 'joined-up' handwriting), Roman, Italic, Olde (sic) English, Gothic, Italian Gothic, Greek and Russian. The range of possible applications is broadened by the inclusion of a large number of graphics characters, covering musical notation,



Create and modify fonts with the editor

astrological symbols, algebraic characters and map features. Each character is designated by a Hershey number, though text can be generated directly from a text string.

In order to assist with the positioning and layout of characters on the screen a number of Basic procedures and functions are supplied. Among the most useful are: centring text at a given height; centring text at the current graphics cursor position; and drawing text between two sets of co-ordinates.

In all, there are nine functions and procedures, not all of which will be required in every display. In order to avoid tying up unnecessary memory, which is always at a premium in graphics programs, the menu-driven software will automatically generate for you a skeleton program containing just those facilities which you require.

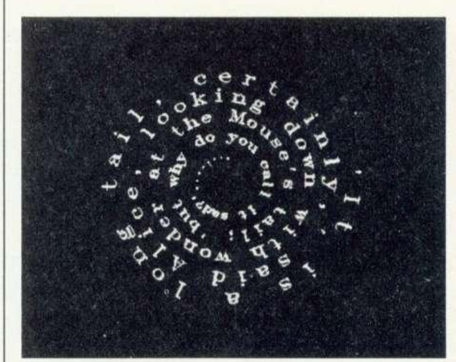
This program generator also loads a series of data statements containing the font or individual characters you want to display. Because of the detail in each character, these data statements are quite long; for example, an upper case italic 'U' requires nearly 100 bytes to define.

A direct consequence of this is that if you want to use one of the 20k graphics modes, it will almost certainly be necessary to load only those characters that you require rather than a whole font. This highlights possibly the biggest limitation on how the package can be used. This is not a fault of the software but results from the size of the BBC micro's RAM, which is beginning to look pitifully small by today's standards.

Having generated the skeleton program, all that remains to be done is to insert the required text or characters and to set the variables to give the required sizes, positions and rotations. The angles of rotation of character strings and of separate characters are individually variable. As the routines are all in Basic and are described in the manual, it is also possible to modify them to your own requirements.

A screen dump is supplied for use with Epson printers and those with Epson-compatible control codes. Although not mentioned in the manual, the way that these characters are encoded make them highly suitable for output to a plotter, provided you're prepared to modify the plotting routines. There is then no need to use a high resolution screen mode and memory becomes less of a problem.

With the disc version comes a second facility called Multifont. This makes available a further 14 fonts, which in this case can be used directly from the keyboard or within programs.



Characters may be individually rotated

These characters are based on a 16 × 16 matrix, being a block of four standard characters.

A very easy-to-use font editor is also included which allows the existing fonts to be modified and new ones to be created. There are facilities to rotate the characters in increments of 90 degrees and also to invert and mirror them. While these characters do not offer the same degree of versatility as the Hershey characters, they have the advantage of being accessible directly from the keyboard and loading a whole font takes up less memory space. The character data for a complete font is stored between &1100 and &1CFF, so PAGE must first be set to &1D00, and some disc commands cannot be used.

The Hershey Font Generator is an excellent utility, capable of giving high quality text and other displays to the limits of the BBC micro's screen resolution – the main limitation is the micro's lack of RAM. **Malcolm Banthorpe**

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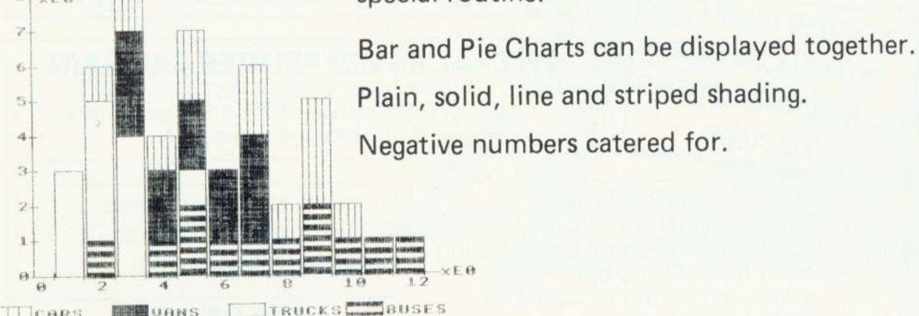
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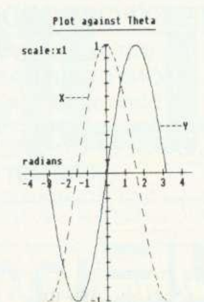
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UTILITY FACILITIES

How helpful are disc utility programs?

Simon Williams compares five

ILLUSTRATION BY GARY WING

WHEN Acorn released its disc interface and DFS, many people were surprised that the disc formatting routine was not supplied with the upgrade (on ROM), but only with Acorn's own disc drives (on disc). Therefore this utility program, and several others, were not easily available to anybody buying other makes of drive.

There were plenty of people only too willing to fill this gap in the market, and a number of companies have introduced specialised ROMs to provide the missing utilities needed to handle discs conveniently, and I'll look at five of these.

One of the first was *Disc Doctor* from Computer Concepts. This is a general-

purpose utility ROM which provides most of the obvious disc utilities, plus a number of routines to manipulate programs in memory.

Floppy Wise, from Software Services, seems to have been put together to complement *Disc Doctor*, as there is very little overlap in the facilities of the two products, although *Floppy Wise* offers several useful routines of its own.

The philosophy behind Beebugsoft's *Discmaster* is to provide the essential disc utilities on a disc, rather than in a chip. It also presents them as selections from a menu, while the other products use a series of '*' commands. The big advantage of this format is the lower cost of the package.

Alligata's *Upgrade Mk II* uses a combination of two media – the main routines are provided in a ROM, with additional, less frequently-used programs supplied on cassette.

The last disc toolkit is still in its pre-production form. *Advanced Disc Toolkit* (*ADT*), from Pres, is perhaps the most comprehensive set of routines and takes up 16k of ROM.

The first table shows a selection of 13 of the most commonly-required disc routines, listed in my own order of importance. It's a subjective assessment, but it should highlight the various strengths and weaknesses of the products.

There are two main requirements of a good disc formatter – it should format a disc reasonably quickly and it should show up any defective track before you start to use the disc. *ADT*, *Disc Doctor* and *Floppy Wise* are considerably quicker than the other two packages. The first two of these also provide a visual display of their progress, track-by-track.

Upgrade Mk II accounts for some of its extra time by displaying a fancy, two-colour go/no go indicator for each track. It will also allow you to format only part of a disc and to 'unformat' one later. This can be used for writing protection routines. All the packages will format 40 and 80 track discs and can be made to verify a disc, either when formatting it, or at a later stage.

When you have saved files onto a disc, it's useful to find out how much space is left. One way of doing this is to compact the disc, using the routine supplied on the Acorn DFS chip. There are occasions, however, when you won't want to do this just to discover the space available. *ADT*, *Floppy Wise* and *Upgrade Mk II* provide a handy function for determining the free space without affecting the disc or the computer's memory.

The inveterate hacker who likes to roam around the computer's memory, changing bytes here and there, will be pleased to know that all except *Floppy Wise* provide equivalent editors for working directly with the contents of a disc. Each of these allows you to display the contents of the disc, sector by sector, and to alter bytes within it at will.

Upgrade Mk II offers an 80 column display for this function, and if you have a monitor or good TV, this allows more information to be shown. *ADT* will display in any mode and offers duplicate cursors showing the hex byte value and the ASCII code at the same time. Both these and *Discmaster* allow hex or ASCII entries, but *Disc Doctor* tops them by allowing binary and decimal input too.

Three of the utilities offer a search routine which will locate any occurrences of a given string of characters on a disc. *Disc Doctor* and *Discmaster* automatically call their respective disc editors when a match is found and display the appropriate sector. *ADT* offers a 'wildcard' search, in which you can replace any character in the search string with a '#'. You can search for a Basic keyword by entering its hex 'token' into any of the routines.

If you store a lot of short files, you may find the total of only 31 filenames per disc surface restricting. *Disc Doctor*, *Upgrade Mk II* and *Discmaster* offer a partial solution to this problem by allowing a second catalogue to be set up on each side of a disc. Each offers nearly twice as many names as the DFS can manage, with *Discmaster* pipping the other two by one filename (61 in total). The 'alternative' catalogue has to be swapped with the regular one – you can't display or use both catalogues at once.

When you upgrade from cassette storage to discs, you'll probably want to transfer most of your tape-based programs. This can be long-winded, and it's useful to have a custom-made routine to do the job for you. All the packages except *Floppy Wise* provide this, but none are designed to cope with the protection systems employed on commercial tapes.

As you probably know, the DFS takes some RAM memory for its own use. This can mean that long programs,

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'A number of companies have introduced specialised ROMs to provide the missing utilities needed to handle discs conveniently'



DISC UTILITY PACKAGES: COMMON ROUTINES

	ADT	Floppy Wise	Disc Doctor	Upgrade Mk II	Discmaster
Format	*FORM	*FORMAT	*FORM	*FORM	K
Speed (1 side, 80T with verify)	57 sec	57 sec	59 sec	149 sec	122 sec
Verify	*VERIFY	*VERIFY	*VERIFY	*VERIFY	K
Free Space	*FREE	*DSPACE		*STATUS	
Disc Editor	*DEX		*DZAP	*EDITOR	A
Disc Search	*DFIND		*DSEARCH		A
Dual Catalogue			*FORM	*DUAL	J
Tape to Disc	*XFER		*TAPEDISC	Cassette	F
Relocate	*MRUN		*DOWNLOAD	*REL/RELD	C
Recover			*RECOVER		B
Disc Copy		*CLONE		*MIRROR	
40/80 Expand		*CONVERT			I
Disc Menu	*MENU		*MENU		D
Disc to Tape	*XFER		*DISCTAPE		
Notes	Second processor and ADFS compatible	Designed to complement Disc Doctor		Utilities on both EPROM and cassette	Utilities on disc. Select from menu

DISC UTILITY PACKAGES: EXTRA ROUTINES

	ADT	Floppy Wise	Disc Doctor	Upgrade Mk II	Discmaster
Other disc utilities	*BACKUP *BUILD *CATALL *DCOMP *DIRALL *FCOMP *FCOPY *FS *LIST *MAP *MLOAD *SECTORS *TYPE	*AUTOSAVE *CONVERT *DERRORS *FCOMPARE *MCOPY *PREPARE *PROTECT *RCOPY	*JOIN *PARTLOAD *RESTORE	*SCAN *ERASE *MOVE *DCOPY *APPEND	Indexer Linker Overlay Expander
Other utilities	*BFIND *ENVELOPE *KEYL *MEX *MFIND *MOVE *ROMS *UNPLUG	*ASCII *ROMS	*EDIT *FIND *MOVE *MSEARCH *MZAP *SHIFT	*DMON	



originally designed to work from cassette, have insufficient room to operate. To run one of these you need a routine which will load the program higher in memory than normal and then move it down, byte-by-byte, to run from its old position. Again, all but *Floppy Wise* will do this.

If a disc gets corrupted, perhaps by a power failure while you're saving a program, it can mean the loss of valuable information. *Disc Doctor* and *Discmaster* will make some attempt at retrieving this data using intelligent 'recovery' routines. These are by no means fool-proof, but can sometimes rescue lost data.

Transferring programs from cassette to disc is one thing, backing up your discs is another. Both *Floppy Wise* and *Upgrade Mk II* provide routines for copying 'awkward' discs, and warn against their misuse. Neither will remain totally effective, since the law of the software jungle dictates that any copying routine will be beaten by the next protection system, and vice versa!

If you upgrade from a 40 track to an 80 track disc, you'll have to convert all your discs so that your new drive can read them. *Floppy Wise* and *Discmaster* provide routines to do so without disturbing any data already recorded on them – clever, eh?

Three of the packages offer routines to set up a menu on your disc, so that you can select your programs from the menu, rather than typing in the filename. *Disc Doctor* and *Discmaster* require the files displayed in the menu to be from special directories. The *ADT* routine displays a menu of whichever directory is added as a parameter to the command ($ is the default).

You might like to take back-up copies of your disc files on cassette tape. *ADT* and *Disc Doctor* provide disc to tape routines which will do this for you – again, they're likely to have trouble with protected discs.

In addition to this 'core' of routines, each package offers a number of unique facilities, either directly connected with the use of discs or more generally applicable to the micro itself. There isn't room here to mention them all, but the second table shows the command names offered by each package, and I'll look at a few of the more interesting routines.

ADT commands include two to produce displays of all the current function key or envelope definitions, which may then be edited easily. There is also a function to display the names of all the ROMs currently fitted in the machine, and to disable/re-enable any of them.

Floppy Wise will also handle your ROMs for you, but a more interesting routine will automatically save the text of a program under development every four minutes. This is done using interrupts and doesn't stop you working on the program while it happens. If you do a lot of program development this could save most of an evening's work. Also in the ROM is a look-up table of ASCII characters and their values.



'So, which is the best buy? Any of the five would be a valuable extension to the routines supplied in the DFS'

One of *Disc Doctor's* routines will join together a series of files under one new filename. You could, for instance, build up a Basic program from a series of standard procedures (although you'd have to take care of the line numbers), or concatenate two wordprocessor text-files. The original files are left intact, and any of the parts may still be loaded into memory independently.

Upgrade Mk II offers a much faster command to backup a disc – a 40 track disc copies in only four blocks.

You can set up an index of all the files on your other discs with *Discmaster*. This can speed the location of an elusive file that you know you saved for later. The routine has some difficulty indexing a dual-catalogued disc, however. More interesting is a ready-made set of routines to handle disc overlays. These allow you to create programs larger than the available memory of the BBC micro, and to divide them into subprograms which can be called up and run in turn. This is the way a lot of commercial software runs on machines with small memory capacities.

All the packages come with reasonable manuals. The best produced, and the most clearly written, is *Disc Doctor's*, which is 40 pages long and covers every aspect of the commands. The *Upgrade Mk II* manual is well laid-out and comes in a spiral-bound form which can be made to stand upright on your desk, but some of the commands need more explanation.

Discmaster's manual is well written and clearly laid-out. The *Floppy Wise* guide is a photocopied, dot-matrix affair, and the software deserves better. The information in it is adequate, but not copious. The *ADT* manual was incomplete, as the product is not yet in production. What there was of it was well thought out, but perhaps a bit too technical for the layman.

So, which is the best buy? Any of the five would be a valuable extension to the routines supplied in the DFS. They vary a lot in size and price and so a strict comparison is unfair. *Disc Doctor*, although the oldest, still offers excellent value for money. The package is well put together and the various utilities integrate well. The same is not quite true of *Discmaster* – it offers some useful utilities comparatively cheaply, but is not as easy to use and feels like a series of separate routines rather than a cohesive package.

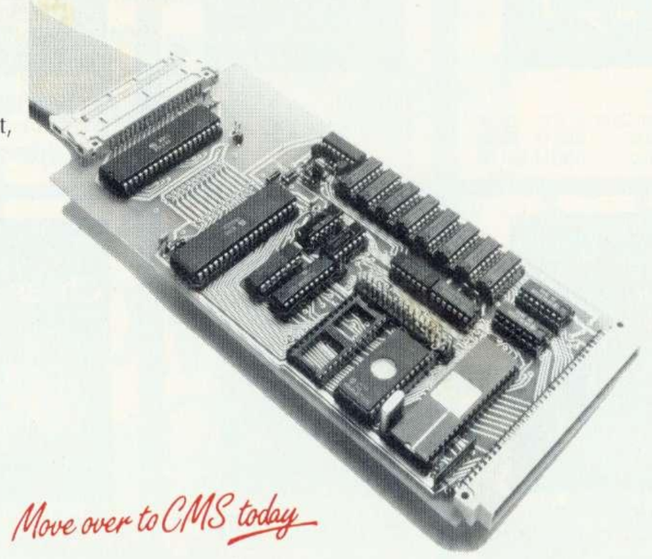
Upgrade Mk II does its job well and sticks to the mainstream utilities. It doesn't stand out in any way and would perhaps be more interesting if all of it were in ROM. *ADT* sets out to be the definitive disc toolkit, but misses out on a couple of important facilities – it's excellent value for money, though. *Floppy Wise* omits quite a few of the standard facilities, but the ones it puts in their place are valuable and well programmed. It's not as useful as the others on its own, but with *Disc Doctor* would form a very useful toolkit.

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Floppy Wise, £29.95, Software Services, 65 Mossley Hill Road, Allerton, Liverpool L19 9BG. Tel: 051-427 7894.
Disc Doctor, £33.35 inc VAT, Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933.
Upgrade Mk II, £39.95 inc VAT, Alligata Software, 1 Orange Street, Sheffield S1 4DW. Tel: (0742) 755796.
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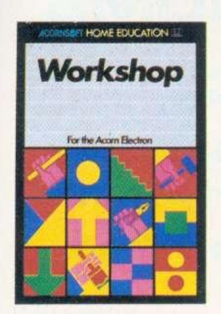
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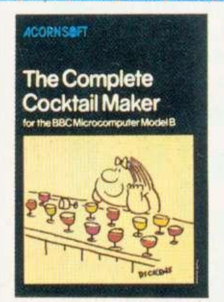
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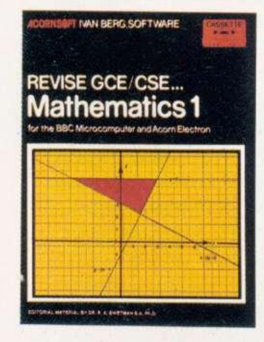
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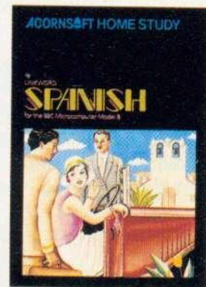
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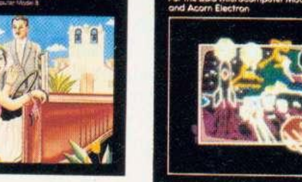
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Altra Probe is available in two versions. PROBE 1 and PROBE 2

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Basic Ed, is on 8K ROM which contains 21 additional commands. They are: $ search, List matches, Number matches, Global replace, Selective replace, Bad programme relink, Copy lines from one part of a programme to another, Format a listing, Move, Super pack, Renumber, Table line references, Unpack, Variables X ref, List entire programme, Keyboard immediate mode, Printer on/off, Paged mode on/off, List match lines, Concatenate, Strips rems, spaces etc. Altra Basic Ed. is an essential helpful tool for the Basic / Assembler programmer. Altra Basic Ed. is available in two versions. Basic Ed. 1 and Basic Ed. 2.

ALTRA BASIC ED. 2 IS TUBE COMPATIBLE

FIRST AID 1.1

First Aid 1.1 is an 8K ROM which contains 19 additional commands. They are: Machine code dissembler, Hex and ASCII dump. Sideways rom to ram copier, Function key predefined facilities, Variable table listing, Memory space free calculator, Checksum calculator, Rom lister, String search, Define function keys with strings, Rem and space Stripper, Bad programme fixer, Clear all variables, Clear ram from &0400 to &8000, Machine code monitor, First Aid 1.1 as a language, Lists O.S. calls with their vectors, Lists the first 24 control codes. Altra First Aid 1.1 was designed to assist the Basic / Assembler programmer and the sideways rom user.

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DFS COMMAND PERFORMANCE

How does Acorn's disc filing system software compare with five competitors? Vincent Fojut gives his verdict

THE first enhancement you're likely to consider for your BBC micro is upgrading to disc operation. A disc upgrade can be broken down into two elements – the hardware, ie, the disc drives and disc interface circuitry, and the software (or firmware), ie, the ROM or EPROM to interpret the extra commands needed to interact with the drives. This firmware is referred to as the disc filing system (DFS).

This review will concentrate on the increasing choice of DFS packages available for the Beeb.

A disc upgrade kit consists of a set of chips which plug into vacant sockets on the BBC micro printed circuit board (PCB). One of these devices is the floppy disc controller (FDC), and only certain types are capable of supporting double-density operation. The standard package of disc interface circuitry is based on the Intel 8271 FDC chip. This has been in short supply and consequently very expensive, but the situation is said to be improving. While it performs its function perfectly acceptably, the 8271 is a rather old design, and doesn't support double-density format. A double-density disc system requires replacement hardware based on a totally different FDC chip.

Finally, we come to the software element. The role of the DFS is to provide commands to read and write data to and from disc, and perform various 'housekeeping' functions, such as displaying file information, locking/unlocking files, copying files from one drive to another, etc. Six different DFSs are under scrutiny – three more or less 'standard' single-density systems, and three double-density systems, incorporating alternative disc controller hardware.

PHOTOGRAPHS BY CHRIS BELL

A series of tables provide a variety of data to allow an 'at-a-glance' comparison between the salient features of each DFS.

Differences in speed and command-sets are also highlighted. The programs used for the benchmarks (table 4) are loosely based on those devised by Joe Telford (*Acorn User*, April '83) with one or two changes and additional tests. For the record, the configuration used for all benchmarks (and reviews) was a BBC model B (issue 7), fitted with Basic 2 and OS 1.2, using two 5.25in TEAC FD55 single-sided, 40-track drives.

Acorn DFS

Like it or not, Acorn's DFS is the 'standard' disc filing system for the BBC micro. In common with the Basic and OS chips, more than one version is in circulation, from 0.90 to 0.98 (the '0.9 series'). The version examined here is release 0.98.

Acorn's design philosophy behind its disc software is not without its detractors. A common bugbear is the amount of RAM which is claimed by the DFS for workspace (&E00 to &18FF), ie, the default value of PAGE, at switch-on, changes from &E00 to &1900 when a standard disc upgrade is fitted. Also, the catalogue structure, which imposes a maximum of 31 files per disc surface, can be a severe limitation.

The DFS is housed in an 8k EPROM (half the size of more recent alternatives) and offers the range of commands outlined in table 1. All other DFSs which claim compatibility must also have the same commands within their repertoire. Indeed, many have added new commands, and even enhanced existing functions, as we shall see later. Although a good number of other commands are used with discs (eg, *CAT, *LOAD, *SPOOL), these are not listed here, since they are Machine Operating System (MOS) commands and are not strictly part of the DFS.

Two crucial commands in any disc system are a formatting command (without this new discs would be unusable), and a verify command, to check a disc for any data corruption. Acorn do not supply either of these commands in their DFS EPROM, and the separate utility disc provided needs to be used for both these functions.

Surprisingly, although squeezed into only 8k, Acorn's 0.98 puts in quite a good speed performance. Its other strong point is that of being 'standard', and as such, all disc-based programs should work with it. While other offerings boast (and achieve) a very high degree of compatibility with the standard Acorn DFS, nothing can be more compatible than the original!

As for its restrictions, these can be circumvented to some degree by extra utilities, eg, programs to create dual catalogues, giving double the files per disc. However, such facilities are provided much more conveniently (as part of the DFS software in EPROM) by other systems.

Watford DFS

Watford Electronics was one of the first companies to offer alternative disc filing systems for the Beeb, and as with Acorn, a number of versions have been released, culminating in the 1.41, reviewed here. The use of a 16k EPROM has enabled Watford to incorporate a number of very useful additional commands (table 2) which

are worth further description.

New format commands (FORM35, FORM40 and FORM80) and a VERIFY command eliminate the need for a separate utility disc. A built-in disc sector editor (invoked by *EDIT) is also particularly useful. This allows disc data to be altered subtly, making corrupt files readable, for example. It can even help you 'resurrect' files deleted in error. You can enter changes in either hex or ASCII.

*MLOAD is intended chiefly for tape programs which have been transferred to disc. Once a file is loaded, the command de-activates the disc system and moves the file down to its original load address. *MRUN acts in a similar way, but automatically runs a program once it has been moved down in memory.

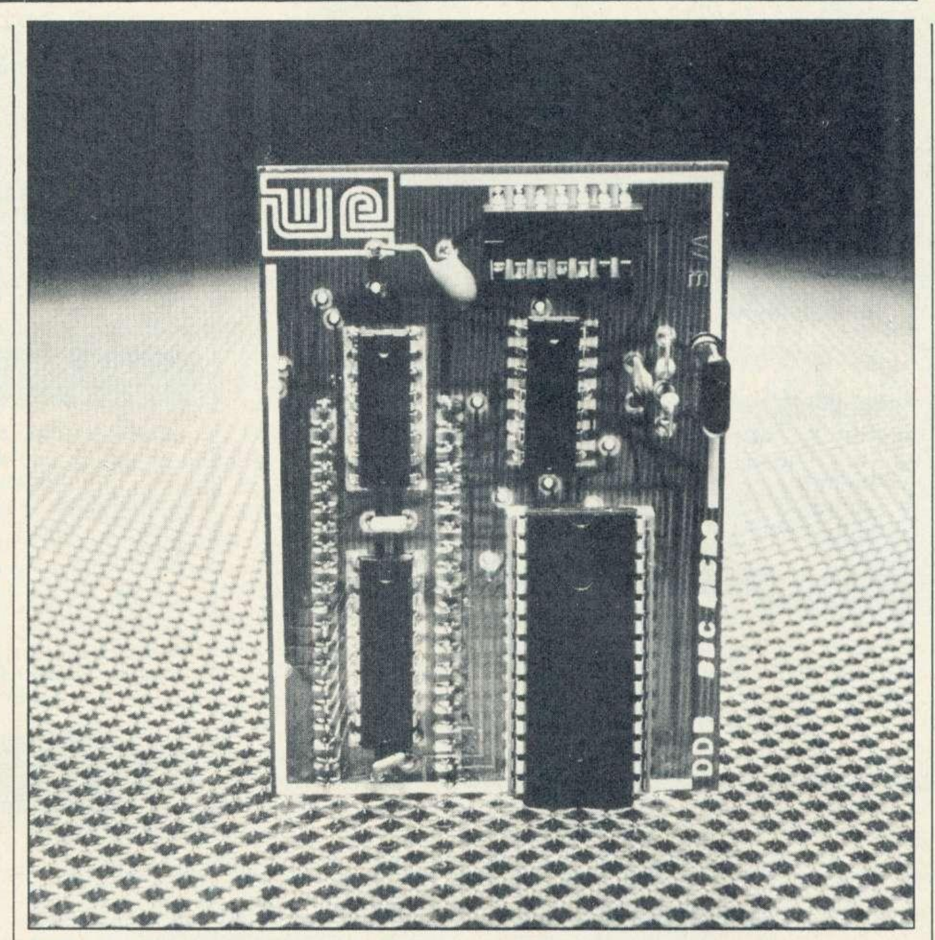
*MOVE behaves like the standard *COPY, but displays each file to be copied in turn. This allows you to de-select certain files within a range which you don't wish to copy.

The *WORK command introduces a novel concept of 'work file'. This is a default file name used by the system whenever a name is omitted from a command. For example, *WORK FRED, followed by SAVE "" would effectively save a file called "FRED". The command can also support auto-version numbering, so that subsequent SAVEs of the work file would store "FRED001", "FRED002", and so on.

*TIDY performs the same function as Basic's CLOSE#0, ie, closing all open files. The advantage is that, being a DFS command, it can be called from languages other than Basic.

Command	Function
ACCESS	lock/unlock files
BACKUP	copy entire disc contents
COMPACT	consolidate disc free space
COPY	copy files between drives
DELETE	delete a single file
DESTROY	delete a range of files
DIR	set current directory
DRIVE	set current drive
ENABLE	enable 'dangerous' commands
INFO	display file information
LIB	set current library
RENAME	change file name
TITLE	set disc title
WIPE	selectively delete files
BUILD	build text file
DISC	select disc filing system
DUMP	list any file in hex/ASCII
LIST	list ASCII file, with line numbers
TYPE	list ASCII file, without line numbers

Table 1. 'Standard' kernel of commands, as per Acorn DFS



Watford double-density board: virtually the same as the single-density

Two new words, FILES and SPACE, have special significance, and are used in conjunction with the *HELP command. *HELP FILES displays information on all open files, giving file handle, pointer values, etc. *HELP SPACE lists any gaps between files, which would be removed by *COMPACT, and gives the total free space on disc. The *HELP command has also been enhanced to work with any single DFS command name, eg *HELP DRIVE provides you with the syntax for just that one command.

Apart from its range of new or enhanced commands, one of the Watford DFS's major claims to fame is that it doubles the possible number of files per disc surface to a maximum of 62. 'Normal' 31-file discs can still be created and used with the system, though. If you've ever been frustrated by the amount of space you can lose on a 'full' 31-file disc, then you'll appreciate what a benefit this feature can be.

The manual provided with the Watford DFS goes into sufficient depth without being difficult to read. It's structured so as to be of use with the standard DFS as well as Watford's own. Existing DFS users, who wish to change to Watford's version, can get a discount if they submit their current ROM with their order.

During the course of this review I received three versions of the Watford DFS (versions 1.3, 1.4 and 1.41)! The latest was faster than its predecessors in some disc operations but slower in others, resulting in no difference in overall rating. It's impossible to know whether this rapid evolution is due to enhancements or corrections (or perhaps a combination of both).

E00 DFS

Like the standard, the E00 DFS comes in an 8k EPROM which is housed, together with its very own RAM, on a small board measuring some 2in square. The whole assembly plugs into a vacant sideways ROM socket via stand-off pins. A suitable control signal is fed to the on-board logic by means of a flying lead, terminated in a probe. This hooks onto the pin of an IC on the BBC main board, and can be further secured by means of a double-sided sticky foam pad. Though this worked satisfactorily during evaluation, the arrangement might not hold up so well to the rigours of transportation.

As the name implies, the default value of PAGE at switch-on, even with the DFS fitted, remains constant at &E00. The RAM supplied on the plug-in board serves as dedicated, uncorruptible disc workspace, freeing existing


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HOW THEY SCORE

	Acorn DFS	Watford DFS	E00 DFS	Watford DDFS	Opus DDOS	Viglen DSDFS
Ease of use	9	8	9	8	8	8
Ease of installation	8	8	7	5	5	5
Range of commands	6	9	6	9	8	9
Range of features	5	7	6	8	9	8
Speed	8	6	5	7	9	7
Standardisation	10	9	9	8	7	8
Overall rating	46	47	42	45	46	45

Marks out of 10. Maximum overall rating is 60

RAM at &E00 to &1900 for other uses.

Apart from allowing longer programs to be stored, the extra RAM greatly simplifies tape-to-disc transfers. Also, tape programs stored on disc can often be reloaded into memory at their original locations, without the need for the usual 'move' routines required by other systems.

However, there are some penalties to pay for this saving in RAM. First, command lines in BUILD files should be less than 100 characters in length. Second, the maximum number of files which you may access at any one time is four (the standard allows five). Unfortunately, the E00 DFS does not prevent you from opening a fifth file, even though it may not be 'safe' to use. The error message 'Too many files' appears only when you try to open your sixth file, as occurs with the standard DFS. Consequently, you may need to exercise particular care when approaching the maximum permissible number of files in your applications.

In all other respects, all commands are exactly as per the standard Acorn DFS.

The instruction sheets supplied list the minor modifications which may be required if the E00 DFS is used with various ROM expansion boards. In the worst case, the DFS may not be compatible with your make of expansion board. To be sure, check with MRM first.

This DFS is not by any means a total disc upgrade, and needs to be used with an existing disc interface. Prospective customers are presumably existing disc users who wish to gain extra memory with the minimum of inconvenience, simply by changing their current DFS EPROM for the new E00 DFS. MRM will also swap your old EPROM for a fiver.

The three packages examined above are all single-density systems. The Intel 8271 disc controller, at the heart of the 'standard' disc upgrade hardware, can support only single-density. On a standard, single-density BBC disc, each track is divided into ten sectors, or 'blocks' of 256 bytes each.

Some other FDCs can support double-density operation. In this mode, each disc track is divided into 18 sectors, still of 256 bytes in length, thereby increasing disc capacity by an impressive 80 per cent.

The following three systems all support double-density operation and so have a number of features in common. In all cases, the disc interface hardware is based on a different, more appropriate FDC chip. This is housed on a separate circuit board which plugs via pins into the 40-pin socket normally reserved for the 8271 chip in the 'standard' disc upgrade.

Incidentally, don't worry about the various abbreviations in the titles – DDFS, DDOS, DSDFD – they all boil down to the same thing. Strictly speaking, a better term to describe the following packages is *dual*-density filing system (we'll use DDFS), since they can all operate in either double-density (18 sectors per track) or single-density (the standard, 10 sectors per track). A disc of any density can be inserted in any drive, and files can be copied between discs of different densities. In all cases, the DFS senses a disc's density automatically. If it is unable to read a disc in one density, it switches density and tries again.

Using double-density, the cost per byte of data storage is considerably cheaper. And, not only does double-density offer more space per disc, but disc accesses are also generally faster.

The software for these DDFSs is written to emulate as closely as possible the operation of the Intel 8271 FDC used in the standard upgrade. However, because the registers and commands used by different disc controllers are not identical, it's not possible for any double-density package to guarantee compatibility with all disc programs. It is possible that some programs could confuse a DDFS by overwriting disc workspace, by directly addressing disc controller registers, or by using the 8271's 'read ID' command, which the double-density software cannot emulate.

Watford DDFS

This is virtually identical in function to its single-density cousin, with the added facility of dual-density operation. Indeed, the range and function of commands is so similar to those of the single-density system, that the same manual is recommended for use with both packages, a single sheet covering any additional points concerning compatibility, etc. Installing the modified disc upgrade hardware is a delicate but straightforward operation, given the instructions provided.

As with Watford's single-density implementation, in addition to a variety of new commands, several enhancements to existing ones have been made. Discs may be configured to support 31 or 62 files (the latter option is particularly relevant in a double-density environment). The *CAT command has been expanded appropriately. Not only does it list the relevant number of files allowed on any disc (31 or 62), but it also now reports whether a disc is single or double-density.

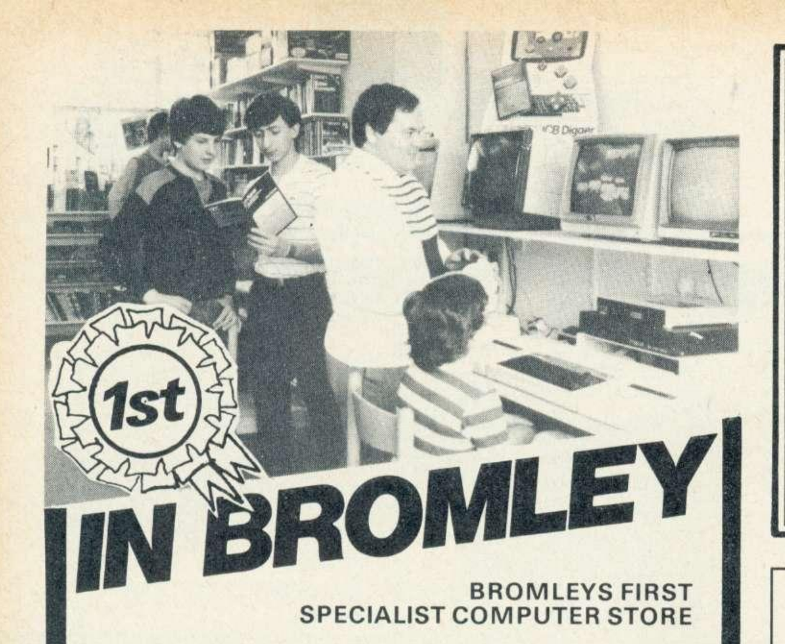
When automatically sensing a disc's density, the DDFS starts by assuming that the density is the same as that applied the last time the drive was read. If this fails, the DDFS changes densities and tries again. Consequently, if you swap the densities of discs inserted into one particular drive, a lot of time will be spent by the filing system simply reading in the wrong density and having to change. It will cope, but take a lot longer than if the densities used in any one drive remain the same.

In most other respects, the density used by the filing system is largely transparent to the user.

In the majority of disc operations, Watford's double-density package is a good deal quicker than its single-

Command	Function
FORMnn	format disc to 35, 40 or 80 tracks
MLOAD	load and move down program
MOVE	selective copy
MRUN	load, move and run program
VERIFY	check disc for corruption
WORK	set current work file
HELP FILES	display info on open files
HELP SPACE	show free memory on disc
EDIT	invoke disc sector editor
TIDY	close all open files

Table 2. Extra commands provided by Watford DFS, Watford DDFS and Viglen systems



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HN482732AG25	Hitachi	3.95	3.75	3.35	2.98
HN482764G-20	Hitachi	4.95	3.95	3.18	2.83
HN482764G-25	Hitachi	4.80	3.70	3.25	2.63
D2764A	Intel	3.95	2.95	2.31	2.21
HN4827128G-20	Hitachi	7.95	5.95	3.95	3.32
HN4827128G-25	Hitachi	6.95	4.95	3.95	2.93
D27256A-25	Intel	19.95	18.50	17.78	14.18
TC5516APL	Toshiba	3.95	2.95	2.47	1.84
HM6116P-3	Hitachi	3.25	2.50	1.98	1.45
HM6116LP-3	Hitachi	2.95	2.75	2.04	1.96
HM6264P-15	Hitachi	8.95	7.95	5.95	4.92
HM6264LP-15	Hitachi	7.95	6.95	4.76	3.85
TMM4164AP-15	Toshiba	2.95	2.25	1.29	0.79
UPD41256C-15	NEC	6.95	6.50	5.95	3.98
UPD8741AD	NEC	13.49	13.49	8.30	6.95
UPD8748HD	NEC	10.50	9.95	7.54	6.25
UPD8749HD	NEC	15.95	14.50	12.95	9.95
UPD8085AC-2	NEC	2.95	2.75	2.56	2.23
UPD7002C	NEC	3.30	3.30	3.30	
UPD8155C-2	NEC	2.95	2.50	1.75	1.68
UPD8243HC	NEC	1.50	1.40	1.30	0.98
UPD8251C	NEC	2.95	2.50	1.50	
UPD8253C-5	NEC	2.50	2.10	1.90	1.69
TMP8255AP-5	Toshiba	2.50	2.10	1.75	1.35
UPD8279C-5	NEC	2.50	2.44	2.33	2.03
UPB8284AD	NEC	2.95	2.04	1.90	1.75

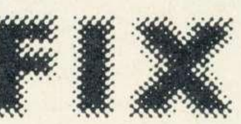
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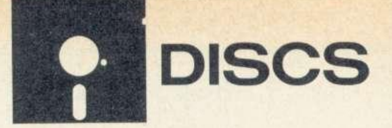




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density counterpart, yet not as fast as another single-density system, the Acorn DFS 0.98.

Again, I received more than one version during the course of the review (1.50, 1.51 and 1.52). There are a few minor changes in the very latest version – for example, DFS settings are now retained over a Break, and apparently more protected software can be run, though I was unable to check this. Speed was identical to the earlier versions, except in benchmark 11, where the latest release was considerably slower! I was also pleased to see that they managed to get their own name right – version 1.51 greets you with 'Watford Electronics DDFS'!

Viglen DSDFS

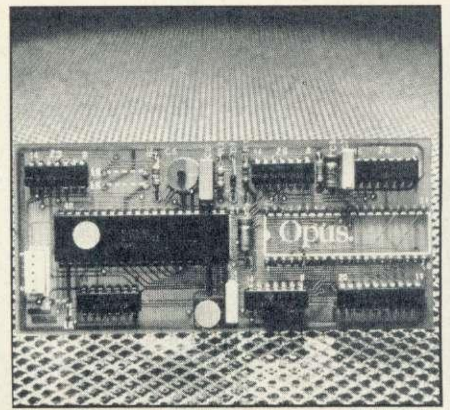
The Viglen DSDFS and Watford DDFS obviously have a common ancestry. Both boast the same enhancements to existing functions, the same new commands and utilities, even identical layout and operation for the disc sector editor. The only superficial difference I detected is that Watford's *HELP SPACE function is renamed *HELP GAPS in the Viglen DSDFS, but it performs in an identical manner. So, for the full range of new commands and utilities provided in the Viglen implementation, refer to the Watford DDFS list in table 2. The comments made in reference to the Watford DDFS apply equally well here. Though the benchmarks figures for the two systems are very similar, they're not identical. One reason for this could be that the Viglen DSDFS is almost certainly based on a different version number to that of the latest Watford DDFS.

Viglen are asking a good deal more for their DSDFS than their competitors, though (as with many suppliers) the price drops if disc drives are bought at the same time.

An interesting booklet was supplied for review with the system. While it gave a very clear and readable guide to using discs with the BBC micro, the document was geared towards the standard DFS, and made no reference to any of the features particular to the Viglen DSDFS.

Opus DDOS

I've already mentioned that the standard limit of 31 files per disc can be restrictive and lead to unusable storage space being left on discs. With a DDFS, a larger catalogue capacity becomes essential to minimise the risk of wasted disc space. While the other DDFSs go some way to improving matters by allowing 62 files per disc, the Opus DDOS adopts a more ambitious approach. The whole of the first track on a double-density disc is given over to catalogue information, and can store up to eight directories (called 'volumes'), each of which can hold 31 files. This gives a potential maximum of 248 files per disc.



Opus DDOS: an ambitious approach

Each volume could be considered as a distinct 'logical' drive, and is identified by one of eight letters, A to H. A specific volume can be referenced by appending the appropriate letter as a suffix to the drive number, which is used in commands in the usual way, for example:

*LOAD ":1C.X.TEST" – load the file called "TEST" in directory "X" in volume "C" on drive 1.

*COPY 0A 0C TEST – copy file "TEST" from volume "A" on drive 0 to volume "C" on drive 0.

If not specified, the volume defaults to A. If the volume suffix is used with single-density discs, it's just ignored, since it has no meaning in such cases.

When a file is formatted, three volumes (A, B and C) are created, sharing the available disc space. The VOLGEN command allows further volumes to be set up (or deleted later) and the disc space available can be reallocated as appropriate. For example, a volume holding just machine code programs, or short demonstrations, may afford to be considerably smaller than a volume holding long, wordprocessor files (though both volumes may still hold up to 31 files). Whenever VOLGEN performs these adjustments, any files on the disc are lost – so it's best to run it immediately after formatting or backing-up a disc.

Since the normal *CAT command only works on a single volume (default or specified), an extra command *XCAT (eXtended CATalogue) serves to list all files under all volumes on a disc.

Table 3 summarises the extra commands and utilities available with the Opus DDOS (in addition to the 'standard' vocabulary). A manual supplied with the review system gives an adequate description of the commands, but appears to relate to an old (or very new) release of the DFS software, since there are a few discrepancies between the commands in the EPROM (as listed by *HELP) and those in the manual. There was no explanation in the documentation for the 'DENSITY' and 'SROM' commands; conversely, a

Command	Function
4080	allow 40-track discs on 80-track drive
DENSITY	(not mentioned in manual)
MCOPY	backup disc to one of different density
SROM	(not mentioned in manual)
STAT	show volume capacity and unused disc space
TAPEDISK	transfer program from tape to disc
XCAT	catalogue all files in all volumes of double density disc
FORMAT	format disc
VERIFY	check disc for corruption
VOLGEN	allocate volumes and/or change their sizes

Table 3. Extra commands in Opus DDOS

	Acorn DFS	Watford DFS	E00 DFS	Watford DDFS	Opus DDOS	Viglen DSDFS
*SAVE 1K	1.3	1.5	1.3	1.2	0.8	1.2
*LOAD 1K	0.3	0.3	0.4	0.2	0.6	0.2
*SAVE 16K	2.9	3.1	3.0	2.0	3.0	2.0
*LOAD 16K	2.2	2.1	2.2	1.0	2.8	1.0
BPUT * 1000	3.5	3.5	4.9	3.0	3.2	3.4
BGET * 1000	2.5	2.5	3.5	2.6	2.1	2.6
PRINT Nos * 1000	6.1	9.7	13.8	8.9	5.9	8.9
INPUT Nos * 1000	4.7	8.5	11.9	8.3	4.9	8.2
PRINT STRING * 100	25.2	44.9	58.8	42.5	23.9	42.4
INPUT STRING * 100	23.2	43.3	55.2	41.6	22.9	41.6
WRITE RANDOM	60.7	67.1	64.7	69.7	49.9	58.4
READ RANDOM	37.7	41.7	43.6	40.7	37.2	40.7
AVERAGE	14.2	19.0	21.9	18.5	13.1	17.6

(Dual-density systems run in double-density mode)
Table 4. Disc benchmarks (rounded to nearest 0.1 second)



further command, 'AUTO40', only appeared in the manual – it's meant to allow both 40 and 80 track discs to be used in an 80-track drive, without any further user intervention.

The Opus DDOS is also notable for its impressive speed – it was the fastest of all systems reviewed.

Conclusion

Of course, everybody's ideal DFS has all the most useful features and utilities you're likely to need, while still retaining 100 per cent compatibility with all disc software. Unfortunately, the best of all possible worlds is not currently obtainable, at least not in one DFS package. If you want to be certain of being able to run *all* disc software, including the increasingly complicated protected discs, the only DFS to offer this security is Acorn's. Admittedly, it's certainly not the best equipped DFS available, but if used together with a suitable disc utility ROM (eg, *Disc Doctor*), its deficiencies can be more than compensated for. Of course, this approach means finding the space and money for two ROMs instead of one, but the combination probably represents the nearest you're likely to get to the 'ideal DFS' outlined above – total compatibility together with an extensive range of facilities.

In the time I had the Watford DFS for review, and with a limited amount of proprietary disc software at my disposal, I did not encounter difficulties with compatibility. Nonetheless, the fact that the product differs from the Acorn standard means that compatibility problems could exist.

Watford operate an upgrade policy, which allows existing Watford DFS users to switch to the latest releases, in return for their old ROM plus a £5 'upgrade fee'. Owners of non-Watford DFS ROMs can also trade these in for a discount.

It must be said that Watford's DFS certainly offers a comprehensive range of facilities at a very attractive price. If you plan to buy each new upgrade however, then (at the rate they are producing them!) you could end up spending as much as you would for a different DFS plus disc utility ROM.

MRM's E00 DFS is very close to the standard, with the exception of the two restrictions mentioned earlier. It's not a particularly fast DFS, but if saving user RAM really is your prime concern, then it may be worth considering.

The BBC B+ is supplied with the new Acorn DFS 2.0. This includes the *FORMAT and *VERIFY commands. In addition, extra commands are provided including *FREE, *MAP and *FROMS. Acorn have given no indication as to when this will be available for BBC B owners.

As for the double-density systems, you're much more likely to encounter compatibility problems with certain protected discs (a number of Acornsoft games, for example). These may constitute a small percentage of available disc software, but if there are one or two specific programs which you simply must be able to use, be sure to check that they will run on any DFS you have in mind.

If you can live with this restriction, then any of the double-density filing systems offers particularly good value, in terms of cost per byte of disc storage. There's virtually nothing to choose between the Watford or Viglen DDFSs, apart from price. However, in spite of no built-in disc sector editor, for my money, the Opus DDOS stands out on two counts. First, it has a greatly increased capacity of 248 files per disc, and second, it's the fastest of all disc systems reviewed.

A couple of recent developments in the Acorn camp are of particular relevance to prospective or existing DFS users.

Any new disc interfaces supplied by Acorn dealers should now include a new software chip, the DNFS. This is a 16k ROM which incorporates two filing systems: DFS 1.2, and the network filing system, NFS 3.6. As the chip comprises two separate filing systems, the initial value of PAGE is set at &1B00, as opposed to &1900.

Version 1.2 is the latest DFS release for a considerable time, and is now to be regarded as the new standard disc filing system. Its most notable advantage over its predecessors is that it's faster, due to reduced disc head loading/unloading during disc operations. Unfortunately, I was not supplied with a DNFS ROM for evaluation in time for the review.

Existing DFS users who wish to upgrade to the DNFS can buy just the ROM for £20.60 (inc VAT) from any Acorn dealer. (At present, Acorn do not offer a trade-in on existing Acorn DFS ROMs.)

A more radical Acorn development, the ADFS (Advanced Disc Filing System), is already available as an integral part of the Electron's Plus-3 disc expansion unit (see *Acorn User*, page 9, March '85). The ADFS adopts a hierarchical tree-structure for directories, which allows far more files per disc than the existing DFS (see the explanatory article on page 31, *Acorn User*, April '84). Furthermore – at least in the case of the Electron – the system supports both single and double-density discs.

There's every chance that any new 'BBC model C' will incorporate the ADFS, and that it will be possible to upgrade on the BBC B+ to the ADFS. Existing BBC micro owners may well also be given the chance to upgrade, using a plug-in extension board. We'll just have to wait and see – Acorn is saying nothing yet.

Clearly there are exciting developments afoot, and the DFS ROM market promises to be an interesting and hotly-contested one for quite a long time to come.

SUPPLIERS

Acorn DFS any Acorn dealer.
Watford DFS and DDFS Watford Electronics, 250 High Street, Watford.

E00 DFS MRM, 17 Cross Coates Road, Grimsby, South Yorks.

Opus DDOS Opus Supplies, 55 Ormside Way, Holmethorpe Industrial Estate, Redhill, Surrey.

Viglen DSDFS Viglen Computer Supplies, Unit 7, Trumpers Way, Hanwell, London W7 2QA.

	Acorn DFS	Watford DFS	E00 DFS	Watford DDFS	Opus DDOS	Viglen DSDFS
Version no.	0.98	1.41	1.20	1.52	3.12	1.00
Single density	●	●	●	●	●	●
Double density				●	●	●
EPROM size	8k	16k	8k	16k	16k	16k
Maximum files open	5	5	4	5	5	5
Page (hex)	1900	1900	E00	1900	1900	1900
Maximum files/disc	31	31/62	31	31/62	31/248	31/62
Format in EPROM		●		●	●	●
Verify in EPROM		●		●	●	●
Disc editor		●		●		●
Price (inc VAT) EPROM only	—	£20.70	£24.95	—	—	—
Full upgrade kit	£105 approx	£102.35	—	£97.75	£99.95	£129
Kit if bought with drive(s)	—	—	—	—	£79.95	£105

Table 5. Comparison of various DFS features

Two for the ROM road

'Basic ROM User Guide', by Mark Plumley, 360 pages, Adder Publishing, £9.95
'The Advanced Basic ROM User Guide', by Colin Pharo, 182 pages, Cambridge Microcomputer Centre, £7.95



FOLLOWING in the footsteps of the highly successful *Advanced User Guide* come two books aimed at providing a similar wealth of information about the entrails of the Basic ROM itself.

Neither book contains a byte by byte blow of the interpreter. Instead they list the various entry addresses to a variety of subroutines, along with entry conditions suitable for use by the machine code devotee.

The *Advanced Basic ROM User Guide* by Colin Pharo comes as a spiral bound affair. The book is conveniently divided into ten sections which comprehensively cover most aspects of the interpreter's number and string handling routines, including integer and floating point storage, base conversion and mathematical functions.

Each section looks at the techniques involved and the various areas of memory used by that particular portion of the Basic interpreter. The section is completed with a brief user's description of the associated subroutines. This comprises the subroutine name, its function, Basic 1 and 2 execution addresses, plus entry and exit conditions to and from the subroutine. The description is completed with an often none-too-clear demonstration program written in Basic 2 only.

The *Basic ROM User Guide* by Mark Plumley contains much of the information provided in the *Advanced Basic ROM Guide* but has a much less mathematical bent. It concentrates more on the actual workings of the Basic interpreter itself. For example, it takes a very interesting look at the workings of the program control mechanisms such as PROCs and FNs; how the expression evaluator works; trapping errors; various ways of adding new commands; and overlaying procedures.

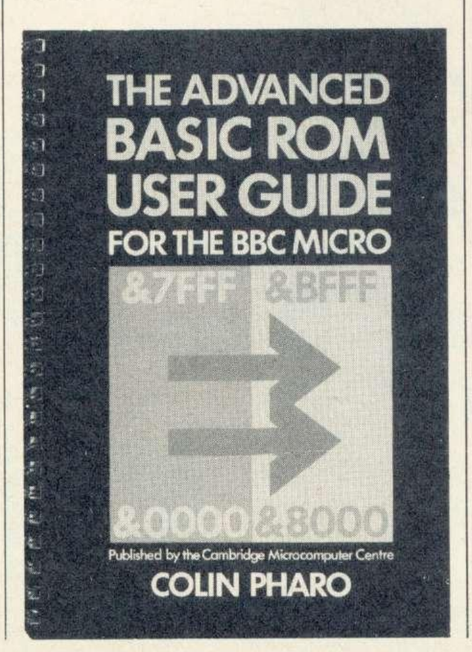
The ROM subroutines are presented in a similar fashion to the *Advanced Basic ROM Guide* but, not surprisingly, all have different names, which is an absolute pain. Practical program demos of these ROM routines are very limited – however, the descriptions of each routine are more than adequate to compensate for this.

If I was writing this book, I would probably have wondered just how practical demo programs would be anyway! However, the book does demonstrate the use of the Basic ROM routines by including them in a variety of useful practical programs (such as a disassembler) which will all run on both versions of Basic.

Both books contain a wealth of information, but as one would expect there is a large duplication of material. Of the two, the *Basic ROM User Guide* is without doubt the more comprehensive and a much better production in terms of presentation and style. I would strongly recommend this book as an initial purchase if you are interested in learning about the Basic ROM itself.

The *Advanced Basic ROM User Guide* has much to commend it, and covers areas avoided by the former such as trigonometrical manipulations and mathematical functions. A useful second purchase if your budget will stretch to it.

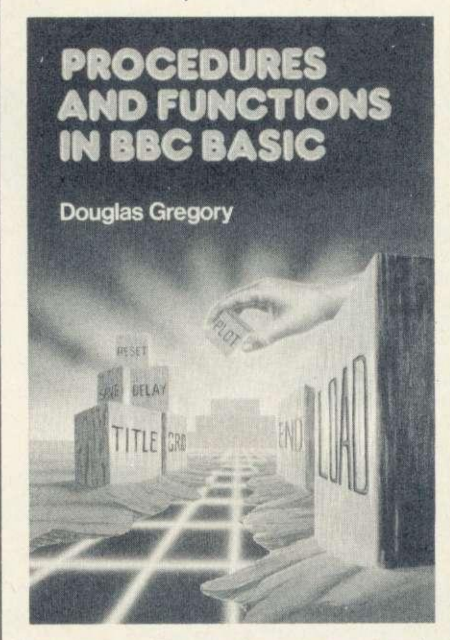
Bruce Smith



Every picure tells a story

'Procedures and Functions in BBC Basic', Douglas Gregory, Addison-Wesley, £6.95

I AM sure the only reason half these computer books are ever commissioned is to provide employment for



illustrators. The covers are true works of art yet they often seem to bear precious little relevance to the subject matter of the book. Take *Procedures and Functions in BBC Basic*: a giant hand descends from the sky to pick a big blue children's building block off the rocky landscape, while the sun sets on the horizon.

Mr Gregory's book, unfortunately, is nowhere near as exciting as the front cover. After an introduction explaining the difference between procedures and functions and how to use them, the rest of the book contains 90 examples, most of which work on the Electron as well as the Beeb. The areas covered include: sound; animation; text windows; graphics; mode 7 displays; and calculations.

The author sees the procedures and routines contained in his book as aimed at novices who don't need to know how they work. Nothing wrong with that, but if that is the idea, why make them so difficult to type in, using difficult and fiddly variable names like 'leftcolm%' when 'L%' would do just as well?

A handbook of procedures is useful for serious programmers, but beginners are better off typing in complete programs which do something worthwhile. Liked the cover, though.

Geoff Nairn

BASIC COMPILER

A really professional Basic compiler for the BBC micro enabling you to write programs in basic which may then be compiled into extremely fast 'optimised' machine code. The program allows the use of a large number of Basic keywords, and long programs – up to 11k of compiled code – may be compiled directly. Larger programs may be produced by using built in overlay techniques.

FEATURES

- Keywords – *Fx,ABS,ADVAL,AND,ASC,CALL,CHR$,CLG,CLS,COLOUR, DEF,DIM,DIV,DRAW,ELSE,END,ENDPROC,ENVELOPE,EOR,FALSE,FN,FOR, GCOL,GET,GOSUB,GOTO,IF,INKEY,INPUT,LEN,LET,LOCAL,MOD,MODE, MOVE,NEXT,NOT,ON,OR,PLOT,POINT,POS,PRINT,PROC,REM,REPEAT, RETURN,RND,RUN,SGN,SPC,SOUND,STEP,STOP,STR$,TAB,THEN,TIME,TO, TRUE,UNTIL,USR,VAL,VDU,VPOS and any O.S. command. (statements starting with *)
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FEATURES

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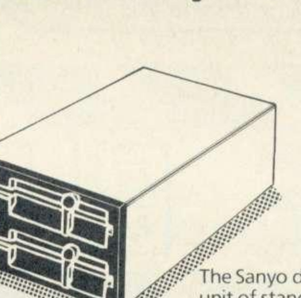
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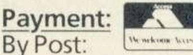
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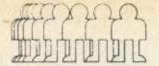




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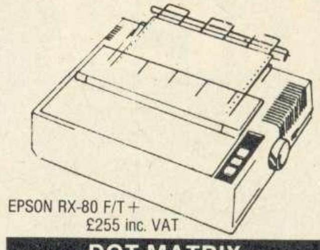
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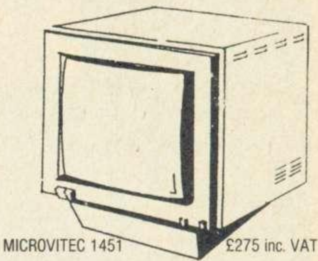
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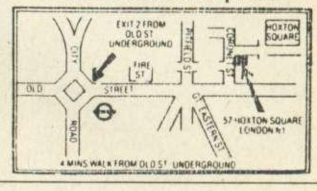
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FOR SALE Tandy CGP115 colour printer, new condition, with extra paper and pens plus lead for BBC micro. £90. Tel: 01-594 6040 after 7pm and weekends.

ATOM SOFTWARE available (massive collection). Write with details of your collection and wants. Particularly interested in: Africa Diamond, Atom Command, Pontoon. Any new software (your own). Martin, 29 Canford Drive, Addlestone, Surrey.

PHLOOPY 100k data storage system for BBC B with full interface kit, three cartridges, manual and cables. Four months old. £75 ono. Tel: Falmouth 317174.

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COMPUTER system. Expanded TRS80I Level II, 32k microcomputer, Tandy LP VII Dot-matrix printer (BBC, Dragon, etc. compatible), + interface + paper, computer monitor, cassette recorder, nearly £200-worth of assorted software/books, 19 tapes. Cash needed urgently. Cost £1150, offers over £325. St Helens (0744) 811816.

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FOR SALE BBC B, unwanted prize, never used. Bits and pieces of software thrown in – offers? Tel: (0502) 3718.

BACK ISSUES of American computer magazines: £1 each (my choice); four for £3.60. Or send SAE for list of books and magazines. Geoff Smith, 84 Edenfield Gardens, *Worcester Park, Surrey KT4 7DY.*

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PRISM acoustic modem with Prestel/Micronet ROM, cables plus manual for BBC. £45 ono. Tel: 01-405 3474, Ext 89 (work) and ask for Chris.

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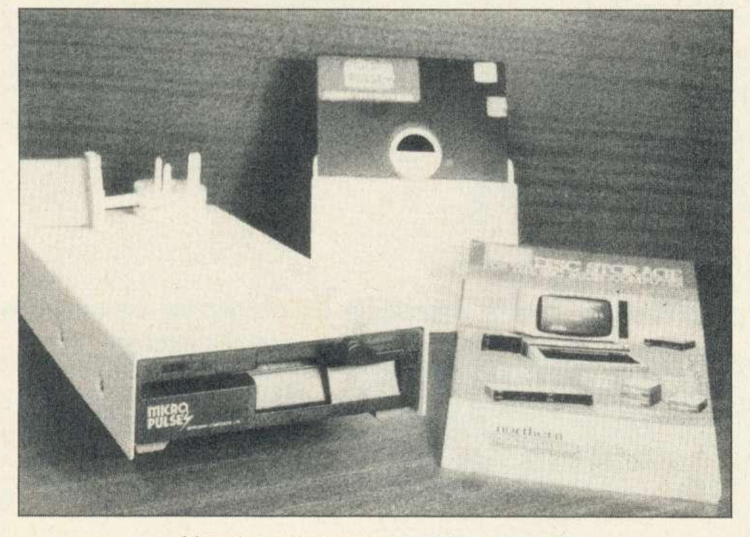
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■ **BBC-Apple** file transfer. Read/write BBC tapes and 100k discs on Apple II. Programs on Apple-DOS formatted disc, £10. TSoft, 4 Lakeland Close, Forton, Preston PR3 0AY.

■ **Super teams!** Bio-rhythms and compatibilities for lovers, athletes and team selectors. 40T £10, 80T £11. Gilvale Software, 10 Sidford Close, Hemel Hempstead, Herts HP1 2LF.

■ **Laser Attack.** New BBC B game for 1 or 2 players, 5 skill levels, joystick option, target score for replay, table of merit, high score. Cassette £5. Vannin Software, 133 Boroughbridge Road, Acomb, York YO2 6AA.

■ **'Nutcrackers':** Tape-2-tape + tape-2-disc + disc-2-tape + disc-2-disc + Tapemaster: £5. Rompull £5. ROM-filing system generator £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

■ **Universal** league tables for BBC B. Features include Load/Save, printout etc. With documentation. Price £5 inc. H. Stirling, 19 Koh-I-Noor Avenue, Bushey, Herts WD2 3EJ.

■ **Convert** 80 track $5\frac{1}{4}$" drive to 80/40 switchable. PCB, switch & instructions £15. Soldering iron required. Magus Electronics, 33 Pool Lane, Winterley, Sandbach, Cheshire.

■ **Recalibration** and repair service for drives! Prices (inclusive of return p&p and VAT) for complete recalibration: single £18, double-sided £20, dual £22, dual double-sided £25. Squirrels Byte, 7 Coniston Road, Melton Mowbray, Leics. LE13 0NE. 0664-63617.

■ **Number Cruncher** game for 1/2 players. Develops numeracy skills. Featured in Fontana's 'Good Software Guide'. Cassette £7.50, disc £10.50. Oxhey Tutors, 19 Tudor Walk, Watford WD2 4NY.

■ **BBC B** with Wordwise ROM and Vufile cassette. Little used, £250. Tel: (evenings) Walton-on-Thames (0932) 229421.

■ **WS2000** multi-standard modem and Commstar ROM. 6 months old and hardly used, only £130 ono. Also software in original packaging from £3. Phone 0702 547814 after 6pm.

■ **Advanced**/User Guide binders. Stiff plastic backed, titled, ring binders. £3.50 & £1 p&p. State which. Hepworth & Co, Waulkmill Farm, Ingersley Vale, Bollington, Cheshire SK10 5BP.

■ **Dustcovers** for the BBC micro. Neatly tailored by leading manufacturer in soft beige PVC. £2.50, post free. Trade enquiries welcome. School Software, 85 Otley Road, Harrogate HG2 0DU.

■ **All Rounder.** The ultimate limited-over cricket simulation. 17 teams with 272 players (5 ratings each from 1984 averages), full league, knockout or single match. Separate averages disc. Two discs £10 or sae for details. Cheques, cash, postal orders to G. L. Brown, 19 Broadgate Close, Birstall, Leicester LE4 3FA.

■ **'How-To'** move your software from tape to disc. An essential collection of software and information for frustrated disc owners: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234 781730.

■ **Hackers!** List the Unlisted, a guide for the novice. Trace unlisted computer phone numbers, auto-dialler routines, log-on, networks, telephone medium, legal notes, £6.50. Andersons, 56 Waterloo Road, Freemantle, Southampton.

■ **BCOMP** full BBC Basic compiler ROM £49.95, DASM symbolic disassembler disc £19.95. BSIDE disc puts compiled programs in ROM £14.95. Mail order only. Orders or SAE for details to Logik Engineers, 84 Portnalls Road, Coulsdon, Surrey CR3 3DE.

We must remind advertisers that we cannot carry advertisements which incite readers to break the protection and therefore copyright of commercial software.

■ **Mice.** For £3.25 I will send you details of how to convert a Trakball into an exact AMX-type Mouse. Jeff Moon, 25 Shotley Gardens, Gateshead, Tyne & Wear NE9 5DP.

■ **Dedicated** no-fuss mailing list program, 591 addresses per 100k disc, up to 100 discs, fully tested, supplied on cassette. Jimsoft, 4 Pownall Gardens, Hounslow, Middx TW3 1YW. 01-577 6115. Write or phone for details.

■ **Egypt:** Are there any BBC owners in Cairo/Heliopolis? So far I have only heard of Spectrum/Commodore. I am temporarily in Egypt (with BBC) and would like to meet them. Koenraad Rutgers, 678233 (after 21.00).

■ **Chemistry software** 16+ to 19+ Organic, Inorganic and Physical Chemistry software. Simulations, CAL, Assessment and Games. Discs and cassettes. Stamped sae for free catalogue: G A Herdman Educational Software, Department AU, 43 Saint Johns Drive, Clarborough, Retford DN22 9NN.

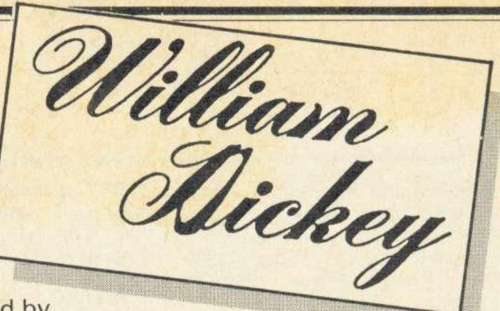
■ **Spider Speller.** New, exciting, educational game for the BBC B. 155 word vocabulary, joystick option, two skill levels, high score. Cassette £5, mail order only. Vannin Software, 133 Boroughbridge Road, Acomb, York YO2 6AA.

■ **'D-Master':** The most powerful disc backup program seen so far: £7. Nutcracker owners £3. Handles sectors from 128-2048 bytes, deleted or not, etc. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

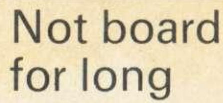
SMALL AD SERVICE

Please include your cheque for £11.50 (inc. VAT) made payable to Redwood Publishing. This is the standard fee. Don't forget your name, address or phone number. Send cheque plus form to Acorn User Small Ads, 68 Long Acre, London WC2E 9JH.

Tale of a tanner



Edited by ORSON FACT



Not board for long

★ **WHAT was that about honour among thieves – or hackers in this case?**

The Manchester-based MOBBS board had whole chunks destroyed by hackers. If it happens again, bang goes the board.

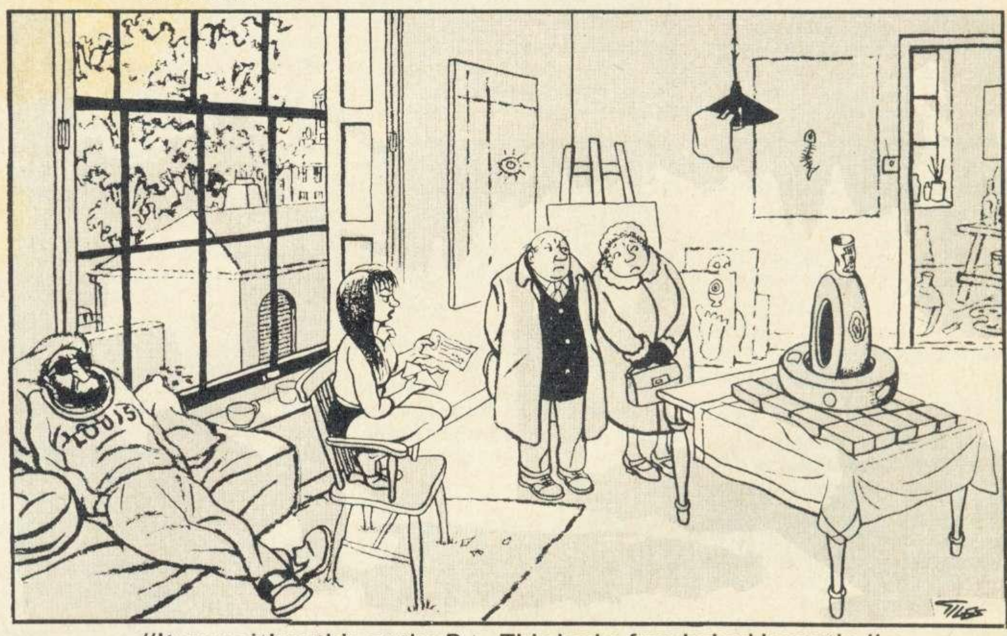
A MEATY piece has come through about **David Babsky** (aka 'Peg Leg' after breaking a limb while parachuting onto a sheep), the voluminous editor of Micronet 800, that gossip-spreading, discombobulated addition to Prestel for us micro owners.

Apparently when the lad was a wee wisp of his present self, and attending Manchester Grammar School, he had his very own Minder, Will the Caretaker.

The story goes that every morning when our doughnut lover turned up for school he would hand over 6d (yes he is so old he used d's rather than p's). Will the Caretaker, would tuck the menial amount (but then it was a lot just after the war) safely under the ashtray in his lodge.

Come going home time David, who didn't have a jam-covered beard at this stage of his development, would reclaim the beloved tanner and off he would go, home.

The reason for this strange behaviour? Simple, it was Peg-Leg's bus fare home – Will minded it all day to prevent sweet tooth spending it on a bumper-sized ice cream cone after lunch!



"It was either this or the B+. This had a free baked bean tin."

★ **THE Diary would like to deny the vicious rumour that MIKE WILLIAMS of Beebug wrote the fast circle-drawing routines in March's issue. Apologies to the real MIKE for any embarrassment.**

Copy~cat rag mag

THEY say imitation is the sincerest form of flattery, but one magazine that used to challenge us for the number one spot is beginning to take it a bit too far.

Not satisfied with ripping off **Keith Waterhouse** in the now defunct Dear Bill column, *The Micro Re-User* published a piece by **Peter Vasey** two months after we carried the very same article on changing colours in *Aviator*.

Now in the June issue they publish a piece on the AMX package a full two issues after it appeared in the hallowed Beeb Forum!

There's probably a lot more re-using going on that hasn't been pointed out to us – but then who reads the rag anyway?

QL 'not so super'



Clive . . . not so super

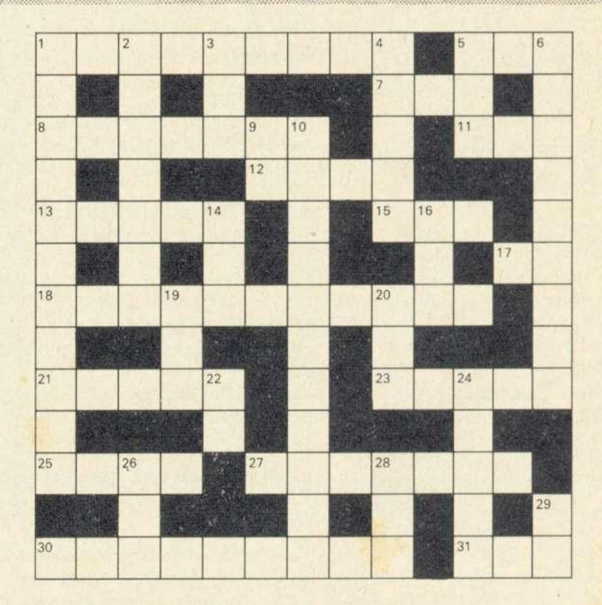
★ **POOR old SIR CLIVE has had the ASA after him again. First, it took ten times as long to load QL software as his adverts claimed, then they decided his SuperBasic wasn't so good and couldn't be called 'the most powerful Basic ever.'**

No 'hi' from Di to Eytie

NEWS of **Prince Charles** and **Princess Diana** failing to visit Acorn's new partner Olivetti during their Italian tour was kept very quiet.

The Royal party upset the Italians by refusing the offer of an M24 as a present for William, thinking it was a motorway and too big for the Royal yacht!

THE LARGE CROSSWORD



ACROSS

1 Intellectual anagram of Orson Fact. (4,5)
5 The permanent chip solution. (3)
7 Is worm processing a trash ——— of words? (3)
8 Treemendous publisher. (7)
11 Once upon a time there was only 0.90. (3)
12 Fairly base, but we all keep it. (4)
13 One a day drives you nuts. (5)
15 Not or. (3)
17 FOR I% = 1 UNTIL 10: Whoops! (2)
18 Medium for running 5 across code. (8,3)
21 Are you one? (5)
23 Most prefer discs. (5)
25 Underground music program™. (4)
27 Someone's leader. (7)
30 Barry Wood wuz 'ere. (9)
31 Beeb's bird (missed off B+ boxes!). (3)

DOWN

1 Visible calculations for accountants. (11)
2 Paranoid Marvin attack. (7)
3 Not on backwards. (3)
4 Seaful of software. (5)
5 Random. (3)
6 They're magic! (9)
9 Sounds like uneven do terminator. (2)
10 Tandem printer accessories? (11)
14 'Bad program' fixer. (3)
16 A drink or a 'ccumulator operation. (3)
19 Crosswords are silly to half an extent. (3)
20 Anagrammatic rodent for AMX ART. (3)
22 Tony Quip's a big one. (2)
24 Original ice-cube pusher. (5)
26 Action if top bit set in 16 down. (3)
28 Comment backwards for a naval-sounding result. (3)
29 A ——— for Clive, a big yawn for mankind. (2)

Answers next month.

Before you go mad at Silverstone, let David Hunt drive you round the bends.

David Hunt, brother of ex-World Champion James, began racing 100cc go-karts at 16.

Now aged 24 and with two successful Formula Ford seasons behind him, David is currently racing in International Formula Three.

START

WOODCOTE

COPSE CORNER

MAGGOTS

BECKETTS

CHAPEL

STOWE

CLUB

ABBEY

SILVERSTONE

MAX. NO. STARTERS: Grand Prix, 36.
LENGTH: Grand Prix (with chicane): 2.932 miles.
SURFACE: Asphalt.

1. COPSE CORNER.
Brake and drop into 4th. Turn in, then accelerate. On a good lap you can hit the exit kerb at 5,400 rpm.

2. MAGGOTS.
Easily taken flat-out. That's around 5,600 rpm in 5th. The power in an F3 car peaks between 5000 and 5,600 rpm. If you put your foot down at less, you'll blow your engine up.

3. BECKETTS.
Approach at 5,800 rpm in 5th (132 mph). Keep left. 60 yards out, hit brake and drop down through 5th and 4th to 3rd.

4. HANGER STRAIGHT.
Drive diagonally across the straight. Clock 5,800 rpm in 5th as you approach Stowe Corner. That's around 139 mph.

5. STOWE.
Supreme test of courage to keep your foot on the loud pedal through this critical bend.

6. CLUB.
Arrive with 5,700 rpm up, to get through in 5th gear. Avoid the apex kerb. It'll flick you into the catch-fencing.

7. CHICANE.
Throw out the anchors. Change down to 4th. Flick left then right. Come out, at around 117 mph. Get the first bend wrong and you lose a lot of time correcting later on.

REVS is far and away the most realistic simulation of motor racing ever devised.

Technically, of course, it's a computer game for the BBC Micro. But somewhere in the middle of your first practice lap you'll realise that 'game' has nothing to do with it.

Instead, you'll experience how it feels to drive every bend, straight and gradient of the world's fastest Grand Prix circuit. In a machine that accelerates from 0 to 100 mph in just 7 seconds.

Gear ratios, engine tuning and handling – they're all accurate in their finest detail and faithfully programmed into REVS.

You can even pre-set the aerodynamic profile of the car to suit your driving style.

So take our advice: before you try for the lap record at Silverstone, study David Hunt's circuit diagram.

After all, when was the last time you had a free driving lesson from a professional?

For the address of your nearest Acornsoft stockist, or to order REVS on credit card, call 0933 79300 during office hours.

Or send the coupon below to: Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL. Please allow 28 days for delivery.

To: Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL.

Please send me REVS for The BBC Microcomputer.

No. of Discs at £17.65 inc VAT__________

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